A Framework for the Assessment of Nursing Tasks and Environmental Demands

by

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ABSTRACT

The nursing profession is pivotal to the delivery of healthcare services within the UK National Healthcare Service (NHS). Twenty eight percent of the 1.3 million NHS workforce are nurses. Studies have shown that an increasing number of older nurses are leaving the NHS as a result of the physical and cognitive demands of the nursing job. In particular, a growing body of literature suggests that ward nurses are at risk of sustaining work-related injuries due to the demands of their job. According to the Person – Environment (P-E) Fit theory, older people become more dependent on the built environment as their physical, cognitive or sensory capabilities diminish. Whereas the benefits of well-designed healthcare environments for patients' healing process are widely acknowledged among researchers, there is a dearth of frameworks or tools to assess the suitability of architectural design features of hospital wards to support the wellbeing of older ward nurses in their work environment. Responding to this challenge, the aim of this PhD research project was to develop a framework to support NHS ward nurses in the ward environment. The research question posed by this study was to explore whether the architectural design features of NHS hospital wards could be improved to create a better fit between ward nurses and their work environment, by applying the P-E fit theory. A qualitative case study research methodology was adopted. This involved the review of relevant literature, combined with qualitative data, collected through interviews and focus groups with NHS stakeholders, including facilities management, human resource management, occupational health department, and ward nurses. In addition, data was collected through the post-occupancy evaluation (POE) of three NHS hospital wards. The interviews and focus groups data was analysed with QSR NVIVO 10 version for windows, using the general inductive approach. The POE data was qualitatively analysed using descriptive analysis. The Nursing Tasks Demand Matrix (NTDM) was created from the analysis of the interviews and focus groups data to facilitate the broader understanding of nursing tasks on wards. Through the review of extant literature, a comprehensive checklist of more than 700 architectural design features was compiled to form the Ward Environment Assessment Tool (WEAT). WEAT was then used to conduct the POE of three NHS hospitals wards in order to determine the adequacy of the architectural design features of the ward elements for the nursing tasks. The results of the WEAT POE were mapped with the NTDM, to form the Nursing Tasks and Environmental Assessment (NTEA) Framework. By mapping nursing tasks to ward elements, an equitable fit could be created between a ward nurse and the ward environment, thereby ensuring that ward nurses continue in gainful employment as they age in their job role. The NTEA Framework may be used by facilities managers, human resource managers, occupational health advisors, ward managers and the NHS management, for refurbishments decisions, in drafting nurses' job descriptions, to perform occupation health screening and for the assessment of the adequacy of NHS healthcare estates for ward nurses. The NTEA Framework is also a benchmarking information tool that could inform design of healthcare facilities.

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LIST OF ABBREVIATIONS

ADL – Activities of Daily Living

DRA – Default Retirement Age

EVOLVE – Evaluation of Older People's Living Environments

FCE – Functional Capacity Evaluation

JD-R – Job Demand Resource Model

MEAP – Multiphasic Environment Assessment Procedure

MSD – Musculoskeletal Disorder

NFCE – Nursing Functional Capacity Evaluation

NHS LTHTR – NHS Lancashire Teaching Hospital Trust

NTDM – Nursing Tasks Demand Matrix

NTEA Framework – Nursing Tasks and Environmental Assessment Framework

OADR – Old Age Dependency Ratio

PAF – Physical and Architectural Features

PCI Score – Personal Construct Impact Score

PCM – Perception Cognition Motion

PEAP – Professional Environment Assessment Procedure

PIS – Participant Information Sheet

PNI Domains – Patient-Nurse Interaction Domains

POE – Post-Occupancy Evaluation

PSR – Prompt Sequential Reactions

SCEAM – Sheffield Care Environment Assessment Matrix

SCU – Special Care Unit

SPA – State Pension Age

TESS-NH – Therapeutic Environmental Screening Survey for Nursing Home

WEAT – Ward Environment Assessment Framework

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CHAPTER 1: INTRODUCTION

1.1 Background to Research Study

The motivation to undertake this PhD research study derived from opportunities and challenges presented by current demographic trends in the UK, due to an ageing population. As an increasing number of people are expected to live long enough to celebrate their hundredth birthday, individuals and families have to contend with old age-related morbidity, which should strengthen the importance of intergenerational relations and solidarity. Older grandparents may partake in the care of their grandchildren, while middle age couples may have to cater for their older parents and grandchildren at the same time. In addition, longevity may have financial consequences for pensioners, as a decreasing number of people in the working age group will have to contribute to the cost of caring for a growing cohort of population in their old age. A very crucial area in which an ageing population will have profound consequences for individuals, their families and society as a whole is the healthcare sector (Majeed and Aylin, 2005).

In England, one of the progressive social actions taken to alleviate Post World War II demise was the introduction of a publicly funded national healthcare system. A shift in social and healthcare provision approach in the UK gave birth to the National Health Service (NHS) in 1948. The NHS was conceived out of the long-held notion that good health should be a right and not a privilege, and should be accessible by all members of the society, regardless of their social status or economic circumstances. When it was established, the NHS was commissioned to operate based on three core principles, namely, it must (NHS, 2013):

a) Meet the needs of everyone;
b) Be free at the point of delivery; and
c) Be based on clinical needs, not ability to pay.

Since its inception, the NHS has always been at the centre stage of public scrutiny. Patients and family members coming in contact with the NHS have an increasing expectation toward the services the NHS is able to offer. There is a continuous public debate on the organisation and functioning of the NHS, around such areas as finance (Hellowell and Pollock, 2009), patient care (Forster and Gabe, 2008), the management of healthcare estates (Payne and Rees, 1999) and workforce management (Hurst, 2006). One of the greatest assets of the NHS is its workforce; and failure in adequate management of its human resources could lead to dire consequences for patients. A notable example is the case of the Mid Staffordshire NHS Foundation Trust (Francis, 2013). In 2009, an inquiry was commissioned by the government to investigate the operation of the Mid Staffordshire NHS Foundation Trust. The public inquiry, chaired by Sir Robert Francis, QC, was initiated after a public outcry that voiced concerns over the higher than 'normal' patient mortality rates at the Trust's hospital. While the problems at Mid Staffordshire were systemic, one of the key findings of the inquiry was that some of the failures could be attributed to suboptimal level of staffing.

Indeed a growing shortage in nursing staff is of great concern to most NHS Trusts. This problem is compounded by a number of factors. For example, 34% of new graduate nurses were not registering to practice (Finlayson et al., 2002). This trend, coupled with the impending retirement of a large number of nurses due to an ageing nursing workforce, has put further strains on the NHS (Buchan and Seccombe, 2012). Efforts to attenuate the impacts of these challenges through the recruitment of nurses from international labour market have had little effects on nursing shortages (Buchan, 2002). The NHS in England is supported by an estimated 21,000 registered nurses and health visitors (Keogh and Flynn, 2016) from the European Union. This accounts for 7% of its total nursing workforce (Rosser, 2016). However, in the wake of the UK exit from the European Union, nursing recruitment from the EU will be abated. A study conducted by the Centre for Workforce Intelligence in 2011 found that more than 55% of registered nurses were not practising in the NHS (CFWI, 2013). This is against the backdrop that the government had undertaken a number of high profile recruitment campaigns, aimed at returning non-practising nurses to the profession, during 1999 and 2000 (NHS Executive, 2000). This includes encouraging private and third-sector nurse practitioners to return to the NHS.

In a comprehensive review of the reasons nurses leave the profession across 10 European countries, including England (this study excluded the other three devolved states of Northern Ireland, Scotland, and Wales), it was concluded that job dissatisfaction, stress and burnout have significant correlation with intention to leave the nursing profession (Heinen et al., 2013). However, this study also showed that 42% of nurses in England reported burnout, compared to a European average of 28%. Other factors attributed to nurses' intention to leave their profession include remuneration (Li et al., 2011); work-family balance (Yamaguchi et al., 2016); and working conditions (Aiken et al., 2013). Furthermore, poor quality of nurses' immediate work environment has been shown to impact on nurses' intention to leave the workplace or the profession (Leone et al., 2015; Leineweber et al., 2016; AbuAlRub et al., 2016). When the propensity to exit the workforce is viewed from age perspective among older nurses (n=352) in Australia with mean age of 61.7 years, it was found that the key motivators were financial security (40.1%); nurse health (17.4%) and retirement age of partner (13.3%) (Duffield et al., 2015). Older nurses in good health condition are said to predispose greater inclination to remain in the profession, compared to younger nurses (Perry et al., 2016); this suggests that retention strategies must consider factors that mitigate health risks for nurses.

In summary, an evaluation of the NHS nursing workforce conducted by the Royal College of Nursing established that (RCN, 2011):

- Patient demand is increasing as the general population is ageing;
- Retention is the key solution to the potential nursing shortage time bomb;
- Working environment practice that supports older nurses working longer is imperative; and
- An inaccessible work environment is a barrier to the retention of older nurses.

While attracting new entrants into the nursing workforce is crucial, this must be complemented by retention of older nurses. The work environment must be accommodating to the demands of older nurses, for them to be able to maintain their work ability for longer.

As an increasing number of older people will be requiring healthcare services, the NHS will experience a flux in the number and severity in health conditions of its patients in the coming years, which will place an increased demand on NHS resources, notably its workforce. However, not all jobs and work environment within the NHS are accommodating to all age groups, without the need for adjustments. Older NHS workers opting to remain in employment may still have to give up their jobs, if the work conditions are simply not conducive for them. For example, faced with the challenges of an ageing workforce, NHS will need to ensure its nurses (the most widely practised profession within the NHS) are retained in employment for as long as possible. However, older nurses may be experiencing deteriorating health conditions that may inhibit their work ability.

Studies have shown that the physical and environmental barriers that must be overcome by an older worker may have evolved over time without any noticeable changes in the work ability of the worker or work environmental conditions. In other words, the decline to an older worker's work ability due to changes in health or work environmental conditions may have evolved without any deliberate alteration to the work environment or any noticeable decline in health conditions. Furthermore, research has demonstrated that there are various reasons why older workers may continue to work or decide to retire, as they advance in age. For example, Perry (2010) acknowledged that the development of certain negative health conditions like weakening of muscle strength and overall decline in sensory capability can be directly attributed to the ageing process; the study, however, fell short of linking such changes in health conditions to direct diminution of older workers' work ability. Diminishing health conditions and proneness to accidents and workplace injuries are the most commonly cited justification for indirect ageism by employers (McDaniel et al., 2012, McVittie et al., 2003).

While there is a slight tendency of vulnerability in older workers, some studies have demonstrated that appropriate duty of care in work processes and employers' responsibilities toward all employees, irrespective of age, will normally eliminate or reduce the risk of accidents at work, without adversely exposing older workers to workplace injuries (Choi, 2009, Crawford et al., 2010).

Black (2008) recognised the benefits of work on both physical and mental health, arguing that older workers' early exit from the workforce usually result in deterioration in overall health conditions, over time. Conversely, research have shown a distinct association between diminished mental health condition as a reason to exit the workforce among people in late adulthood (Olesen et al., 2012), even if minimal or partial adjustment to work content and/or workplace design could have helped the retention of such persons. In physically demanding jobs, the elimination or reduction of the risk of occurrence of musculoskeletal disorders (MSD) will normally support older workers to continue working as they age (Oude Hengel et al., 2012).

Some schools of thought advocate for alterations to work contents or redesigning the work processes as a means to accommodate declining work abilities in older workers (Caplan, 1987). Person-Environment Fit (P-E fit) theorists, on the other hand, consider that productivity at work and job satisfaction is directly dependent on the relation between the incumbent worker and the work environment (including other social and psychological work circumstances). Furthermore, in a recent research into P-E fit, Peace et al. (2011) argue that dependency on key environmental circumstances may compromise people's work ability as competence declines and environmental conditions change. These propositions, however, failed to acknowledge the intuitive compensation afforded by long-term work experience of older workers; which has been claimed to offset the potential decline in physical, physiological and cognitive conditions in older people (Cvitkovich and Wister, 2001). Other studies disregard the person and environmental elements in the P-E fit and take the stance that flexible work organisation, like part-time work, distant working, job sharing, and even partial volunteering, are acceptable ways of maintaining the work ability of older workers (Unson and Richardson, 2012).

There is an insurmountable amount of literature that deals with P-E fit theory and practices (Iwarsson, 2005, Iwarsson, 2012, Iwarsson and Stahl, 2003, Edwards and Cooper, 1990, Nehrke et al., 1981, Oswald et al., 2005, Oswald et al., 2003, Suresh et al., 2006, Thomese and van Groenou, 2005). However, most of these studies have approached the subject from the perspective of health and wellbeing, by exploring the natural implications of the ageing process on cognitive, physiological, physical and psychosocial abilities and needs. Furthermore, a common stance of these studies is the appreciation of the relationship between older people and their micro and/or macro environments, with special emphasis mostly on age-friendly environment, through enhanced accessibility and adaptation of the built environment (Iwarsson and Stahl, 2003). What must be acknowledged at this stage is that some of these studies have established the 'ability' of the built environment to support older people's independent living through better housing design. By applying the P-E fit theory, it is claimed that a better fit could be created between older people and the built environment through the thoughtful design of the residential setting.

Most of the available literature have drawn on the earlier works of Lewin (1951), Lawton and Simon (1967) and Lawton and Nahemow (1973a). In each case, all of these researches have dealt with the passive period of the life course, during which the members of the studied age cohort have undergone significant deterioration in functional capacity. Hence, the studies have concentrated on how to enhance active ageing by revitalising activities of daily living (Iwarsson, 2005) in domiciliary settings, rather than on the job and environmental demands of the workplace with respect to older workers, as proposed, but not fully explored, by Perry et al. (2012).

While it is important to acknowledge the vast amount of knowledge that has been generated on the P-E fit theory by these studies, it must be noted that only a few of them have been undertaken where the focus of study is on specific aspects of the work environment, as did Edwards and Cooper (1990) on organizational stress, without particular reference to older workers. Furthermore, those that have dealt with P-E fit and older workers in the work environment, have done so with respect to human resource management (Kristof-Brown and Guay, 2011), where job content specifications and expected competences were studied, and far little attention have been given to age-friendly workplace design for older workers (Pinheiro and da Silva, 2012, Pinto and De Medici, 2000, Wright, 2003, Roper and Yeh, 2007).

This research is unique and shall make original contribution to knowledge because it considers the physical, cognitive, sensory and universal constructs typical of older workers in a specific workplace and due to its focus on age-friendly and inclusive workplace design. Moreover, this research is expected to make significant contribution to knowledge, by applying the P-E fit theory to a large impact employer like the NHS, and focussing on a widely practised profession such as nursing.

1.2 Formulating the Research Question

This research study was conceived as a response to the enduring demographic trends that can be experienced in most industrialised nations of the world, including the UK. While investigating this complex phenomenon could be daunting, contextualising the research and delimiting its scope eventually resulted in the study's research question. For instance, within the broad topic of an ageing population, this study could have explored a variety of issues older people are facing, including job security and the challenges of lifelong learning (Jarvis, 2005); post-retirement engagement and pension (Griffin and Hesketh, 2008); older people's interaction with information technology (Thompson and Mayhorn, 2012); the life course phenomenon (Worth and Hardill, 2015); ageing and globalisation (Hyde and Higgs, 2016); or older people's participation in the silver economy (Ahtonen, 2012). Evidently, it would have been impossible to investigate any of the aforementioned topics in adequate depth in one thesis, given the available time and resources. More importantly, time and resource constraints alone are no justification for not disentangling the topic and formulating a research question. The postulation of a research question helps the researcher to contextualise the research topic. The context of a research question may assume a combination of dimensions, including demographic, geographic, theoretical underpinning, or timeframe. Contextualising a research study, and generating a 'research question' helps the researcher to delimit the scope of the study. This is an iterative and flexible exercise that is performed at the beginning of the research project until a desirable research question is born.

Within the demographic dimension, the research question in this PhD study has been shaped by considering the relationships between an ageing population and an ageing workforce. It is readily evident that gaining a better understanding of an ageing workforce in itself is too broad and less worthy of investigation, hence it was necessary to further narrow down the scope of the study in order to arrive at a 'manageable unit' research question. Likewise, in the face of resource constraints, this study has established a geographical field of investigation by making the choice upfront to conduct the research in the UK. Furthermore, selecting the healthcare sector, and within that the nursing profession in particular, has further reduced the scope of investigation, and has helped to shape the formulation of the research question. Within the nursing profession, the focus of study has been narrowed down to NHS ward nurses. From a theoretical perspective, it is noteworthy that, as suggested in section 1.1, a number of studies have demonstrated how the P-E fit theory can be used to create age-friendly environment in various settings. The P-E fit theory has been applied in the support of age-friendly housing environment through the better application of architectural design (Iwarsson and Stahl, 2003). The primary premise of such studies is the attainment of independent living by older people within their physical and psychosocial milieu (Parmelee and Lawton, 1990). The question is how the P-E fit theory could be adapted in this PhD study to create an age-friendly work environment for older ward nurses within the NHS. With regard to timeframe dimension, this research project deals with contemporary challenges of an ageing population; hence it is positioned as addressing the issues of the present. The hypothetical research question postulated in this study is thus that:

> ***" How could the architectural design features of NHS hospital wards be used to create a fit between ward nurses and their work environment, by applying the P-E fit theory?"***

Architectural design features are the design characteristics of the built environment that assign functionality to design elements and enhance seamless interaction between those elements (Monroe et al., 1997) and their users (Peri Bader, 2015). In this study, the architectural design features relate to the ward elements where ward nurses carry out their daily duties. Architectural design features include attributes of the ward environment such as layout, accessibility of spaces, signage, lighting, colours, sound insulation, ventilation, thermal comfort, and furnishing (Prochorskaite et al., 2016). This study must attempt to demonstrate the impacts these architectural design features have on ward nurses, and how these could facilitate a fit between ward nurses and the ward environment. It is anticipated that a thorough evaluation of the architectural design features of NHS hospital wards would unpick design issues, which, if adequately addressed, would support ward nurses in their job role, and help them remain in gainful employment for longer within the NHS.

Kishore et al. (2011, p. 184.) claim that a research question must be "…clear, focused, concise, complex and arguable". Evidently, the research question formulated in this PhD study exhibits all these characteristics. This research question is clear in that it specifies in an unambiguous way what the research is aiming to achieve. Furthermore, this research is focused primarily on a particular profession within the NHS, and within that, on ward nurses. Also, the research question has opted to investigate the interior architectural design features within the perimeter of the hospital wards, and not, for example, the building envelop, the exterior natural environment, or other components within the healthcare facility. The research question has been framed concisely, in that it does not contain redundant parts that may detract from its effectiveness to accomplish its aim. Exploring how architectural design features could be used to create a fit between ward nurses and the ward environment suggests that an adequate level of complexity can be attributed to this research question. Finally, by applying the P-E fit theory, the research question has presented an arguable position, of attempting to adapt an existing theory for use in a new setting.

Connelly (2015) highlights three distinct features of a research question. Firstly, a research question must establish the phenomenon that is being studied. Secondly, the research question must identify the population upon which the study will focus. Thirdly, the research question must specify the knowledge gap in the research topic. The phenomenon that is being investigated in this research is to explore how architectural design features could enhance the ability of ward nurses to function in their work environment. The population to be studied are ward nurses and the knowledge gap is the adaptability of the P-E fit for use in the work environment as opposed to its original application in housing for older people. While the research question has been streamlined to embody the research phenomenon, the population of study and the knowledge gap, its accomplishment must be measurable in form of aim and objectives for the project to achieve its purpose.

1.3 Aim and Objectives

The overarching aim of this PhD study is to explore how the design of NHS hospital wards could support nurses' capabilities, and ensure older nurses continue in gainful employment for longer. In particular, this research will:

1) Establish the impacts of changing trends in the age profile of the UK workforce in the Post-World War II period;

2) Evaluate the Person-Environment Fit Theory and its applicability to the design of an age-friendly and inclusive workplace within the NHS;

3) Establish the characteristics of an age-friendly and inclusive NHS workplace by identifying the prevailing factors that inhibit or compromise the health and wellbeing of older NHS workers;

4) Identify the challenging job and environmental demands of older nurses within the NHS;

5) Determine the functional capacity of hospital ward nurses within the specific NHS establishments; and, finally

6) Develop and validate Nursing Tasks and Environmental Assessment Framework, which will support the creation of fit between ward nurses capabilities and NHS hospital wards.

The ultimate objective of this study is the development of the Nursing Tasks and Environmental Assessment (NTEA) Framework in order to create an age-friendly workplace within the NHS. The NTEA Framework is neither a software nor an algorithmic schedule, but a model that can be used to facilitate the health and wellbeing of nurses in the workplace within the NHS setting. The NTEA Framework will be a multidisciplinary manual that can be used by facilities managers, human resource managers, occupational health advisors, designers and other stakeholders that have an interest in maintaining a fit between ward nurses and their work environment. It is noteworthy that caution must be applied in the implementation of the NTEA Framework so that its precept is not abused or misused to deter older nurses from continuing to work on hospital wards, or as a coercion to retain them in an ill-designed work environment. Hence, the NTEA Framework will be adaptable, flexible and expandable, depending on the environment in which it will be used.

1.4 Methodological Approach

The central question postulated in this research study is to explore the possibility of creating a fit between ward nurses and their work environment within the NHS, by applying the P-E fit theory. As suggested earlier, this requires an approach that attempts to understand the characteristics of the person and the environment. It is therefore important to determine what types of data are required to adequately answer this research question, then decide how these data will be analysed and, finally, devise the most appropriate methodological tools that can be used to collect the data. In this regard, it is necessary to ponder over what data would be required to measure the characteristics of a ‘person’ and what data is needed to undertake the assessment of the environment. The nature of this research study lends itself to the application of certain conventional methodological approaches. While a quantitative research approach is concerned with the measurement and the numerical counting of occurrences, a qualitative research approach attempts to illuminate an event as unique, and offer individual definitions to social phenomena (Burns, 2000). A case study qualitative research method has been designed for this research study because this method is expected to capture the most relevant information that can help answer the research questions. However, qualitative data have been corroborated against quantitative data. While a substantial amount of qualitative data is collected to determine aspects related to the ‘person’ in the P-E fit, the assessment of the characteristics of the ‘environment’ required the compilation and analysis of quantitative data. This ‘quasi’ mixed-methods approach is expected to ensure more robust research data and results are obtained.

The next question is to identity an appropriate case study. Where and how will data be collected? Which case will adequately embody the type of data to be collected? To answer these questions, it is important to consider that this study is sponsored by the University of Central Lancashire, Preston. As the researcher and all other resources, including the supervisory team, are situated in Northwest England, it is logical to explore the possibility of collecting data from sources nearby. The researcher contacted the Centre for Health Research and Innovation, at NHS Lancashire Teaching Hospital Trust (LTHTR), in Preston. At the initial meeting the objectives of the research and what was required of the NHS were clarified. The NHS LTHTR specified the necessary NHS approval to be obtained prior to the commencement of data collection.

The empirical data collection for this study is undertaken in five phases. In the first phase exploratory interviews will be conducted with eight NHS managers and two practising nurses, in order to understand the overall atmosphere of NHS work environment with regards to an ageing workforce. The second phase entails an exploratory focus group study with six nurses to establish the job and environmental demands of NHS nurses. Based on this understanding detailed investigative interviews will be conducted in the third phase with ward nurses so as to understand the nursing tasks and ward work environment, and the possible interplay between them. The fourth phase will proceed to assess the physical characteristics of NHS hospital wards, through post-occupancy evaluation (POE). The triangulation of the results of the investigative interviews and the POE of the NHS hospital wards, would be used to construct the NTEA Framework. In the fifth phase the constructed NTEA Framework will be presented to stakeholders in a focus group setting to validate the results of the study. The following section will highlight how the objectives of this study have been accomplished by briefly discussing each chapter of the thesis.

1.5 Thesis Structure

This thesis contains nine chapters including this introduction chapter. Apart from Chapter 9, which discusses and summarises the findings of the study, each chapter has been prepared to contribute to the accomplishment of one or more of the research objectives outlined in Section 1.3 of this chapter. Please see Figure 1.1 for an illustration of the structure of the thesis and how these objectives have been achieved.

Chapter 2 presents the literature review undertaken in order to establish the existing body of knowledge in this field. It started by introducing the literature search strategy, then the eighteenth century Malthusian theory of population is explored, which offers a basis for contemporary discourse of population change. Secondly, the surge in population growth in the decades Post-World War II, is discussed in the context of the impact the impending retirement of those born during that period will have on the labour force. This broader understanding of UK demographic trend contributed to the accomplishment of Objective 1. Then the gerontological contexts of ageing are explored, including successful ageing, the life course phenomenon and environmental gerontology. The theoretical underpinning of this study is established as the Person-Environment (P-E) fit. It is demonstrated that the P-E fit, a theory that has been used to illuminate the interaction between older people and their home environment could be adapted and applied in this PhD study. The P-E fit theory has been previously used to explain the affordances of the design of the built environment to support older people's housing provision. It is therefore conceptualised that the P-E fit can be adapted to explore the interplay between older workers and their work environment in this study. The accomplishment of Objective 2 of this research project is demonstrated at this stage.

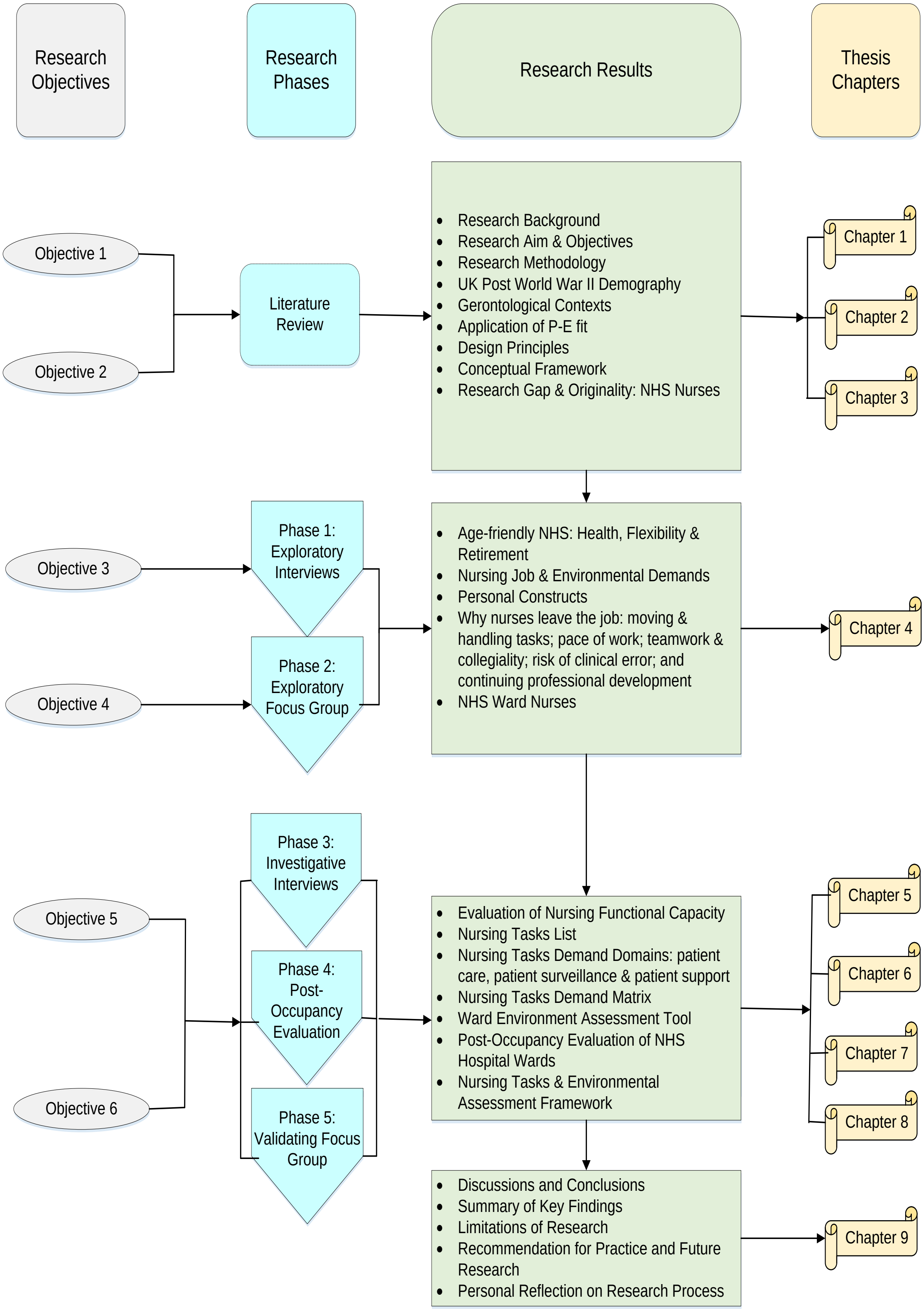


FIGURE 1.1: Thesis Structure

Chapter 2 continues by discussing three main design principles, including universal design, inclusive design and user-centred design. At this stage, it will be established that, based on the premise of the P-E fit theory, these design principles could be employed to create a fit between older workers and the work environment within the NHS. The ramifications of an ageing population for the NHS will then be investigated and it will be established that the cardinal role that nurses play within the healthcare system position them as an interesting research subject from the perspective of this PhD study. Chapter 2 then presents the conceptual framework of the study to include job demands, functional capacity and environmental demands of older nurses within the NHS. The chapter concludes by demonstrating how the literary evidence gathered thus far informs the subsequent stages of the study, what research gap has been identified and how this study could make original contribution to the existing body of knowledge.

Chapter 3 discusses the research methodology that guides the study. After a brief introduction to the philosophical assumptions that are made in the study, the chapter discusses the two major research paradigms, including the positivist and the interpretivist worldviews. It is shown that as a qualitative social science research, this PhD study is situated within the interpretivist worldview. Based on this understanding the two main research methodologies are explored; i.e., quantitative and qualitative methodologies. At this point it is established that a qualitative research methodology best answers a significant part of the research question postulated in this study. However, it is necessary to support this with the strengths offered by quantitative research methodology. This thus raises the question of the most appropriate approach to undertaking the study. The five most commonly used research approaches in social sciences research are briefly discussed, and the justification for choosing case study research approach to data collection and analysis are given. Chapter 3 continues by highlighting the research design, which shows the key milestones of the study and how each of the six research objectives are achieved. The chapter concludes by demonstrating how quality is embedded in the research process by applying certain reliability and validity measures. These measures add rigour to the study at the data collection, data analysis, data synthesis and result construction stages.

Chapter 4 presents the first evidence of empirical data collection. This chapter contributes to the accomplishment of Objective 3 and Objective 4. First, through exploratory interviews undertaken with 10 managers and practising nurses, the characteristics of an age-friendly NHS is established as one supporting employees' health, offering job flexibility and demonstrating awareness of older workers' impending retirement. These findings demonstrate the fulfilment of Objective 3 of this study. Given its potential impact on the NHS ageing workforce, this stage also establishes that the nursing profession should be the focus of further investigation. This study thus proceeds by undertaking a focus group with six nurses. The focus group establishes that most ward nurses will most probably move to more sedentary roles within the NHS, rather stay on the ward. Moreover, ward nurses are more likely to exit the profession, if alternatives to ward nursing are not forthcoming. The main job and environmental demands; i.e. the five reasons cited by participants why ward nurses leave the ward area are due to moving and handling tasks; pace of work; risk of clinical error; lack of adequate collegiality and teamwork; and their inability to participate in further trainings. The findings of the exploratory focus group study demonstrates the accomplishment of Objective 4 of the research study.

In Chapter 5, the ward nurse role is further explored by investigating the tasks nurses perform on hospital wards within the NHS. As this chapter is designed to fulfil Objective 5 of this PhD research project, which is to determine the functional capacity of hospital ward nurses within the NHS, the results of the investigative interviews with 20 ward nurses are presented. The nursing functional capacity evaluation is conceptualised as a result of the direct or indirect interactions between patient and nurse. As such, the three 'nursing tasks demand domains', based on patient-nurse interactions (or PNI domains), are presented; namely patient care, patient surveillance and patient support. Furthermore, the chapter presents the 23 nursing tasks, which are then mapped with their appropriate PNI domains. Through the mapping of nursing tasks with the relevant PNI domain, the Nursing Tasks Demand Matrix (NTDM) is created, which is being presented as an alternative to mainstream functional capacity evaluation instruments. Objective 5 in this study is thereby fulfilled in this chapter.

In Chapter 6 it is established that beyond nursing tasks, there is a need to undertake an objective assessment of the physical characteristics of the nursing practice environment. The 14 ward elements, identified as constituting the spaces where the 23 nursing tasks may be undertaken, are presented. These 14 ward elements are identified through the analysis of the investigative interviews with 20 ward nurses. It is demonstrated that post-occupancy evaluation (POE) of the hospital wards is necessary in order to establish the adequacy of the ward elements for the nursing tasks. However, in the absence of an appropriate tool to conduct these POEs, the rationale to develop a new tool for the assessment of these ward elements is presented. Therefore the study reviews five existing tools used in similar settings, building standards, research-based best practices, and the empirical accounts of the investigative interview responses of the 20 ward nurses to inform the development of the Ward Environment Assessment Tool (WEAT). More than 700 architectural design features are identified, which can be used in form of a walkthrough checklist to assess hospital wards.

In Chapter 7 WEAT is used to conduct POE surveys on three NHS hospital wards at the case study hospital, where the 20 interviewed ward nurses are located. The results of the implementation of WEAT on these three hospital wards are discussed. By administering WEAT on the three NHS hospital wards, the extent to which the design features of the ward elements support nurses' personal constructs (namely, physical, cognitive, sensory and universal) is established. This is denoted by the Personal Construct Impact (PCI) score awarded to each ward element, through the administration of WEAT. The PCI score is a percentage score, and the higher the PCI score of a ward element, the better it is deemed to support the personal constructs of ward nurses. A better support of the personal constructs of ward nurses, on the other hand, will ensure these nurses are able to stay in their job role for longer. The PCI score offers objectivity to the evaluation of ward elements, as the accounts of the ward nurses obtained during the investigative interviews are corroborated against independent evaluation of the physical characteristics of the ward elements. As will be demonstrated in Chapters 6 and 7, the descriptive analysis of these quantitative data will reinforce the findings of this study. Therefore while this PhD research has essentially taken a qualitative methodological approach, the administration of the WEAT checklist has produced substantial quantitative evidence that suggests the research may well be ascribed a ‘quasi’ mixed methods study.

Chapter 8 presents how the Nursing Tasks and Environmental Assessment Framework is developed. This is done by mapping each of the 23 nursing tasks identified under the Nursing Tasks Demand Matrix against the 14 ward elements assessed with the Ward Environment Assessment Tool. First, it is established that some ward elements are more relevant to some nursing tasks than others. Three levels of relevance are identified. The relevance of the ward elements to the nursing tasks may be high (H), medium (M) or low (L). The relevance of a ward element to a nursing task is denoted as high (H) if the nursing task is designated to be carried out in that ward element. The relevance of a ward element to a nursing task is recorded as medium (M) if the nursing task is not designated to be performed in that ward element; however, it does happen that such a task in practice may still be performed in the ward element. The relevance of a ward element to a nursing task is rated low (L) if the nursing task in not designated for that ward element and if the ward element is inappropriate for such nursing tasks, even if experience proves otherwise. The triangulation of the results of the NTDM and the findings of the POE conducted with WEAT is used to create the Nursing Tasks and Environmental Assessment Framework. The result of this mapping exercise is presented to NHS stakeholders in focus group to validate if the findings of the study were representative of the situations in the wards. This chapter also demonstrates the accomplishment of Objective 6 of this PhD study.

In Chapter 9, this thesis concludes by discussing the major findings of the PhD study. First a summary of the key findings of the study is presented. It is argued that the societal impacts of the UK ageing population will have profound effects on the NHS, and the implementation of the NTEA Framework may be used to attenuate some of these effects. These findings are presented based on the theoretical-conceptual underpinnings and the practical outcomes of the study. First, by using an existing theory (the P-E fit) in a new context for older nurses. Secondly, by the conceptualisation of nursing tasks as involving direct or indirect interactions between nurses and patients and through the creation of the NTDM, a new approach to nursing functional capacity evaluation is established. Thirdly, in the absence of a readily available instrument to conduct POE on hospital wards, WEAT is developed. While WEAT contributes to the accomplishment of answering the research question of this study, it also proves to be a tool that can be used on a stand-alone basis to undertake POE on hospital wards, without the NTEA Framework. These findings are discussed in both legislative and theoretical contexts; namely the Equality Act (www.legislation.gov.uk, 2011) and the Capability theory by Nussbaum and Sen (1993). The central tenet of both being to create independent living in people, irrespective of age or disabilities. The limitations to the research study and recommendations for practice and future research were briefly highlighted. The chapter closes by presenting some of the personal reflections of the researcher on the research process.

Figure 1.2 summarises the final outcome of this PhD research project. As noted earlier, the theoretical underpinning of the study is the P-E fit, which means that the NTEA Framework should create a fit between ward nurses and ward environment. This is supported by the two components of the NTEA Framework.

The Nursing Tasks Demand Matrix establishes the nursing tasks list and the nursing tasks demand domains. The Ward Environment Assessment Tool, on the other hand, measures how the ward elements support the four personal constructs of ward nurses to create a fit between them and the ward environment. It is important to note that while the construction of NTDM had preceded that of WEAT in the research process, the two has together concurrently informed the creation of the NTEA Framework.

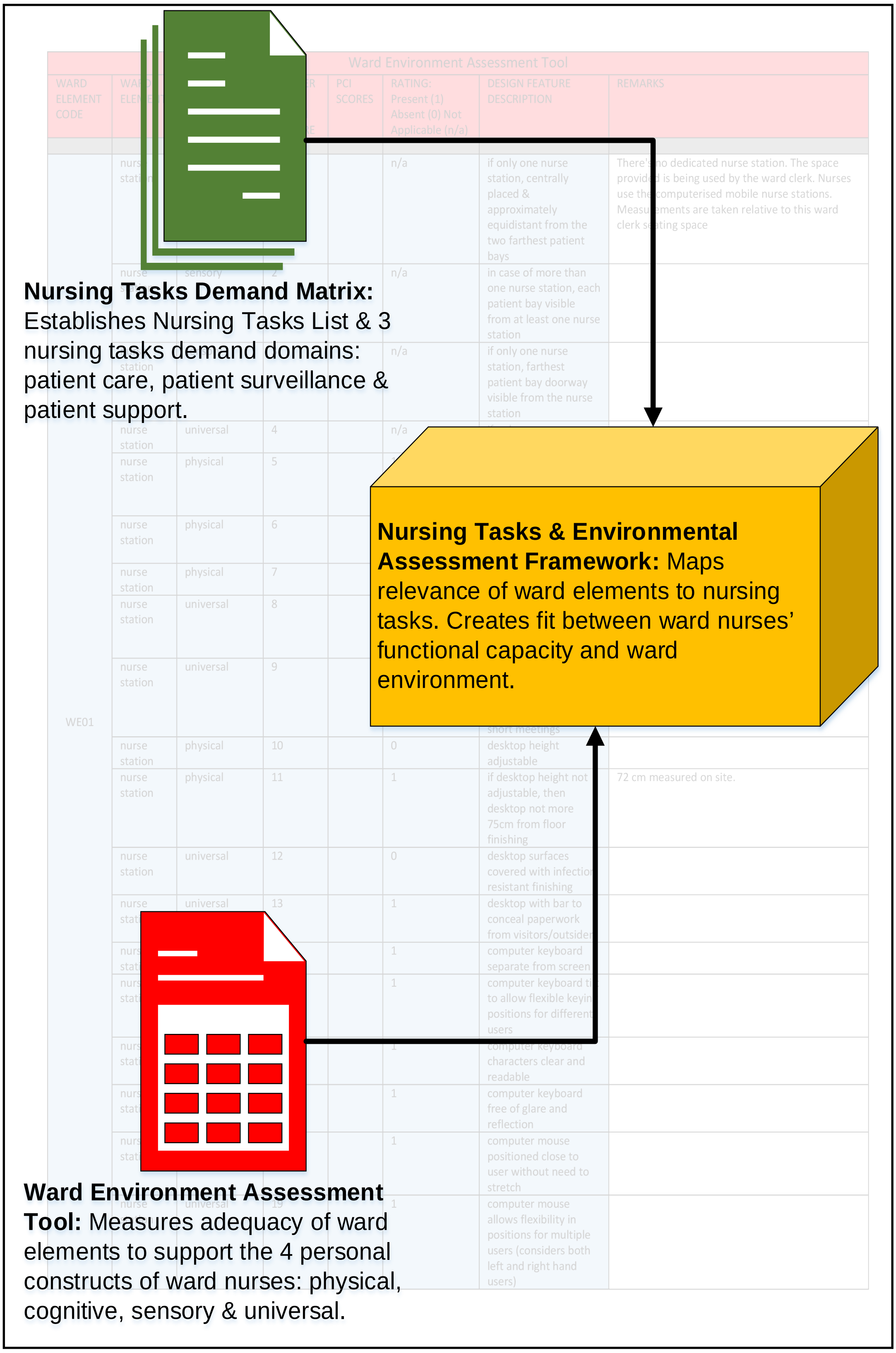


FIGURE 1.2: NTEA Framework Components

1.6 Summary of Chapter 1

Chapter 1 introduced this research project by first presenting the background to the study. Motivated by the demographic trends of the UK population, this study starts by demonstrating how the ageing workforce will affect the NHS and NHS nurses as they age in their job role. Against this backdrop, the relationship between the health of older workers and their work ability were discussed in the broader context of the Person-Environment Fit theory. A research question was formulated which posits to explore if the architectural design features of NHS hospital wards could be used to create a fit between ward nurses and their work environment through the application of the P-E fit theory. The research question was broken down into six different objectives, the accomplishment of which would help answer the research question. Chapter 1 then discussed the methodological approach that will be followed in order to achieve the outlined objectives of the study. It is argued that the research question could be answered through the objective assessment of the ‘Person’ and the ‘Environment’ components of the P-E fit, in form of the nursing tasks and the nursing practice environment. This requires the development of the Nursing Tasks and Environmental Assessment (NTEA) Framework. Chapter 1 then discussed the methodological approach that will be followed in order to achieve the outlined objectives of the study. It was established that while this study will employ a qualitative case study research approach, by using quantitative corroborative evidence, this research is better noted a ‘quasi’ mixed methods research study. Chapter 1 concluded by outlining the structure of the thesis and how each of the objectives of this research study are accomplished in the chapters of the thesis and how NTDM and WEAT supported the development of NTEA Framework.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter presents the literature review that established the foundation for this PhD study. While the review of the literature was continuous throughout the project, the initial literature review presented in this chapter formed the basis of further literary and empirical investigations. First the strategy for the literature review is outlined, consisting mainly of the guidelines that supported the review. The UK's demography is then presented by reviewing the political discourse of population change through the Malthusian theory of population in the eighteenth century, until Post-World War II period. Then the current demographic challenges, resulting from the baby boom era that started after the Second World War, are discussed, with implications for current trends put in perspectives. Furthermore, the gerontological contexts of ageing are discussed, by highlighting how older people relate to their environment, with particular focus on successful ageing, the life course phenomenon, and environmental gerontology. In addition, the theoretical foundation of the research study is laid by reviewing the person–environment interactions. It is established that the Person–Environment Fit theory could be adapted to form the theoretical underpinning of this research study. Three design principles are presented as an approach to enhance the use of the built environment through design. The societal challenges posed by the ageing UK population are highlighted, with respect to the healthcare services, and the role of the NHS and the nursing profession in particular is emphasised. A conceptual framework is developed, as an outcome of the literature review, which is a roadmap that should guide both the theoretical and the empirical investigation of the study. Finally, this chapter concludes by presenting the initial findings of the literature review, the identified research gap and the rationale for developing the Nursing Tasks and Environmental Assessment Framework.

2.2 Strategy for Literature Review

The prior review of existing literature is a critical component of an academic research study. A literature review reveals what is already known on the topic and offers a solid foundation to advancing knowledge, by identifying potential areas of future research (Arksey and O'Malley, 2005). In devising the most appropriate approach to the literature review in this study, due consideration has been given to the fact that although this is a multidisciplinary research, the project sits within the built environment discipline, and this must be acknowledged in the way the literature is sourced or used. For the same reason, it was apparent that a systematic review of the literature would have been cumbersome and less effective in gathering and identifying relevant literature for the study (Dawson et al., 2015). It was necessary to articulate a unique search strategy that would provide comprehensive coverage of existing research evidence in this topic area. A decision had to be made on those areas or topics that must be covered in the literature review. It must, however, be acknowledged upfront that whilst this ad hoc approach to literature review offers the researcher greater latitude over the search strategy, it may be contested to contain some elements of subjectivity. It was therefore necessary to define the guiding parameters applied in this literature review (Fillary et al., 2015). These are:

i) Topics and keywords
ii) Sources
iii) Backward and Forward sourcing of literature
iv) Timeframe
v) Language
vi) Bibliographic and Referencing Tool

2.2.1 Topics and keywords

The starting point for the literature review of this PhD project is to consider what the ultimate goal of the research study is. While the literature review was ongoing throughout the course of the research project, there were critical stages that required extensive review of literary evidence. For instance, at the beginning of the research it was necessary to establish the existing body of knowledge on the research topic. This allowed the researcher to take certain hypothetical standpoints, such as the possibility to explore if an existing theory (in this case the P-E fit) could be applied in a new setting. This broader understanding was then converted into aims and objectives of the study. This is particularly crucial to help break down the overarching goal of the study into specific objectives that could create a pathway to achieving the ultimate aim of the study. After the six objectives outlined in Chapter 1 had been established, the literature review was conducted in such a manner to either support the establishment of existing knowledge along the trail of thoughts pertinent to each research objective or to corroborate empirical findings aimed at fulfilling the research objective. In accordance to the research objectives outlined in Chapter 1, the topics that were identified that must be covered in the initial literature review are (i) the historical perspectives of UK demography and its trends post-World War II; (ii) Gerontological contexts of ageing; (iii) the Person – Environment interactions; (iv) Design Principles; (v) the National Health Services and the Nursing profession. The goal was to ensure literary evidence that would be gathered in these topics converge to support the construction of evidence to answer the research question. In addition, defining the search terms and keywords is probably one of the most important part of the literature review. This is where the researcher runs the highest risk of omission. As stated earlier, the search terms were created for each of the topical areas identified for review, and by applying the backward and forward sourcing strategy described below, this risk has been minimised.

2.2.2 Sources

The second parameter that had to be decided upon was how and where to source literature, in order to have adequate coverage and with as minimal omission as possible. Based on the identified topics, decisions had to be made which databases (including, CINAHL Complete, Ebrary Academic Complete, Ebsco eBook Central, Ethos or MEDLINE or Science Direct), journals, books, websites or key authors, must be sourced to achieve breadth in coverage, without being overwhelmed with search results or falling into the trap of omission. Decisions had to be made in what instances electronic or hard copy resources should be used or when it was desirable to use a book. For a topic in which the researcher had limited knowledge, a book was used to establish a broad knowledge base, after which journal articles would be resourced to refute, reinforce or fine tune the evidence. Furthermore, it is importance that reference is to the original author and effort is made to avoid citing “in-cite” citations. However, it should be appreciated that this might not always be feasible. In the event that a primary source is not available due consideration must be given to the credibility of the secondary source in order to avoid snowball effect of misrepresentation.

2.2.3 Backward and Forward sourcing of literature

This approach is expected to produce a snowball effect of identifying relevant literature for the study. This is based on the premise that knowledge creation is evolutionary, and most scientific studies would have relied on pre-existing knowledge in the subject area (Vom Brocke et al., 2009). Therefore, it is presumed that probing the reference lists of published papers (backward sourcing) would lead to further literature resources to which the researcher might otherwise not have been able to identify. This is also true for research papers which have cited the sourced literature (forward sourcing). This can be achieved by monitoring and reviewing articles which have cited the ‘original paper’, through for example the web of science (Webster and Watson, 2002). The combined approach of backward and forward of literature sourcing has been deemed to produce additional relevant literature, and thereby increased the coverage of the literature review (Herz et al., 2010).

2.2.4 Timeframe

Care was taken to ensure that the literature used was as current as possible. A guiding principle regarding the time span covered in the literature searched and used was that it must have been published after 1 January 1990. The reason for this cut-off date is that most of the studies pertinent to the topic of this PhD research were published after this date. For example, research in the field of environmental gerontology related to the built environment proliferated after the early 1990s (Lawton et al., 2000; Iwarsson, 1999; Mace, 1997). Furthermore, political awareness and legislative promulgations regarding accessibility to the built environment began after this date, first in the USA through the American with Disabilities Act (United States Department of Justice, 1990). Later this movement was put into law in the UK through the creation of the Disability Discrimination Act of 1995 (www.legislation.gov.uk, 1995), which was later replaced by the Equality Act 2010 (www.legislation.gov.uk, 2010). However, this cut-off date should be treated with caution, as credence has been given to pioneering studies that predate this set date due to their prominent role in the generation and evolution of the knowledge base in the particular topic. This applies to the earlier studies conducted by M. Powell Lawton in the field of environmental gerontology (Lawton, 1977; Lawton, 1970; Lawton and Simon, 1967). In the same sense, when it was necessary to present historical perspectives of a topic, original papers have been sought to help establish a chronological knowledge base. For instance, to determine the trend in UK population ageing required sourcing relevant literature beyond the stated cut-off date, such as the historical perspective offered by the 'Malthusian Theory on Population' (Malthus, 1926) discussed in section 2.3.

2.2.5 Language

Literature sourcing has been restricted to publications in English Language alone. The choice of English language is for practical reasons, as inclusion of publications in other languages would have created unwarranted bottleneck to the study due to limited resources and lack of expertise in the very many languages that might have published relevant literature in the topics of interest. Moreover, it is presumed that most of the (known) work in the subject are already in English, therefore the backward and forward search strategy employed would have identified further relevant papers, even if they were not originally published in English.

2.2.6 Bibliographic and Referencing Tool

Finally, another critical parameter of the search strategy is the use of an adequate bibliographic tool or software. In order to ensure that electronic resources are properly identified, captured and collected, bibliography tools have become indispensable. This study used Endnote bibliography tool throughout, therefore consistency of literature search could be guaranteed.

While the aforementioned parameters set out in this section have been the guiding principles in the review of literature for this study, the emphasis was not to undertake an all-encompassing review of literary evidence available on the research topic. The overarching aim of the literature review was rather to identify and critique critical authors' views and drive the case for how the architectural design features of hospital wards could facilitate the creation of a better fit between ward nurses and their work environment within the NHS, by applying the P-E fit theory, while, at the same time, the study would make original contribution to knowledge.

2.3 The Malthusian Theory of Population and the Industrial Revolution

In any country, population growth is usually affected by three main factors; namely, fertility rates, mortality rates and the impact of net migration. While the phenomenal changes in

Europe's demography in the nineteenth and twentieth centuries have defied the eighteenth century Malthusian theory on population, this theory still offers a comprehensive basis for intellectual discourse of contemporary demography trends in modern history. According to Malthus, "…population constantly bears a regular proportion to the (amount of) food the earth is made to produce" (Malthus, 1926, p. 55). In his *Essay,* Malthus argued that, unchecked and without external stimuli, a community has an infinite capability to increase its population through natural reproduction, provided the basic 'necessaries of life' are available to support its members. He therefore suggested that this natural reproduction capacity of man has the potential to grow its population by geometric ratios while the 'means of subsistence' may only be increased by a given arithmetic ratio within an ecological setting, and only the demise of starvation and war may curb this growth. In other words, Malthus is suggesting that a community's population will continue to grow 'indefinitely', provided there are abundant natural resources to support its livelihood. Malthus further proposed that a 'normal' society in good health cannot be expected to exercise 'self-restraint' in childbearing, in so much as food, the basic necessary of life, is sufficiently plentiful. While Malthus continues to be regarded with reverence by many contemporary demographers and sociologists (Fogel, 1994, Flew, 1957), there is little doubt that some of his atheoretical hypotheses about population growth have withered in the last two centuries.

Firstly, although Malthus appreciated the prevalence of the industrial revolution of his time, he could not foresee the transformation it was going to bring to England and the rest of the early-industrialised nations. For example, the advancement gained in the eighteenth century in the mechanisation of agricultural farmland in England (Overton, 1996), defied even the pre-Malthusian era, when economic theories of 'diminishing returns' were first postulated (Brue, 1993). Such a progressive leap in industrial development established the basis for mass cultivation of arable farmland; therefore the nineteenth and twentieth century communities were not limited in their production capacity by their absolute manpower.

Secondly, Malthus had not disguised his intention to inform and influence the social policies of his time; he was adamant in his belief that the affordance of material subsistence to the poor would incentivise childbearing among young couples and thus lead to 'unsustainable' population growth that would only regenerate poverty. However, it has since been evident that fertility rates in UK decreased in the twentieth century despite economic affluence afforded by the industrial revolution (Ashton, 1966). Advances in medical science, which reduced infant mortality rates, meant families could 'afford' to have fewer children, because the chances of their offspring surviving were higher (Reid, 2002).

Thirdly, whereas Malthus acknowledged the occurrence and recurrence of wars in human history as a 'natural regulator' of populations, he could not have foreseen the great wars of the twentieth century. Post-World War II, after Europe had lost a significant proportion of its (reproducing) adult population group, national governments put in place socioeconomic measures to facilitate and increase fertility rates. Social protective nets were implemented that incentivised childbearing in the late 1940s and 1950s, through to the early 1960s. Children born during this period are referred to as the ‘baby boomers’, most of whom are now in (or approaching) their retirement.

The industrial revolution that began in England in the eighteenth century marked the beginning of a new world order with respect to human-machine relationship. The premise of this relationship is productivity; i.e. a greater amount of output must be produced with the least possible resources. The human-machine relationship intensified during this period when, in production factories and on an agricultural farmland, productivity was seen as a means to an end in the provision for an increasing population (Allen, 1999).

2.4 Post World War II UK Population Trend

A population is said to be ageing if the median age is increasing over time. The median age is the age above and below which there is an equal number of people in the population. Median age increase is usually the result of both increasing life expectancy and decreasing mortality rates. Emphasis must be given to the age cohort in which the positive mortality rate is being experienced. For example, it has been suggested that the increase in life expectancy is not just the effect of more people living longer, but also the predominance of the older age cohort, compared to a reduction in child mortality rates (Committee on Chemical Toxicology and Aging, 1987). However, population ageing is more complex than this. Another factor that affects population change is the total fertility rate of a country or community over a period of time. The total fertility rate is the average number of children a woman bears during her fecund life. Demographers put the ‘healthy’ total fertility rate of a country at 2.1, which is the average number of children every fecund woman in the country should have for the population to be ‘self-sustaining’, through natural reproduction. Figure 2.1 shows the total fertility rates for England and Wales in Pre- and Post-World War II periods. This graph shows that the only period the total fertility rates had been above the 2.1 children per woman was in the period immediately after the Second World War. In effect, the spike in birth rates experienced during this period gave rise to the baby boom phenomenon. This period began in the early 1950s and ended in the late 1960s. Such demographic change constitutes a challenge for society as a whole, cutting across areas like health and social care, intergenerational dependency and solidarity, the labour market, pension and housing. Hence, there is a need to redefine what it means to be young or old in an ageing society. This may require rethinking the way all the major players of society interact and where key roles intersect.

In as much as population growth is induced by net increase in the sum of fertility and mortality rates, it must be appreciated that a decrease in fertility rate is usually preceded by a decline in mortality rate. Furthermore, while birth rate is influenced by a combination of the consequences of individual decisions and societal trends, the lapse between the onset of the decrease in mortality and fertility rates is affected by various factors, depending on the economic and sociocultural settings.

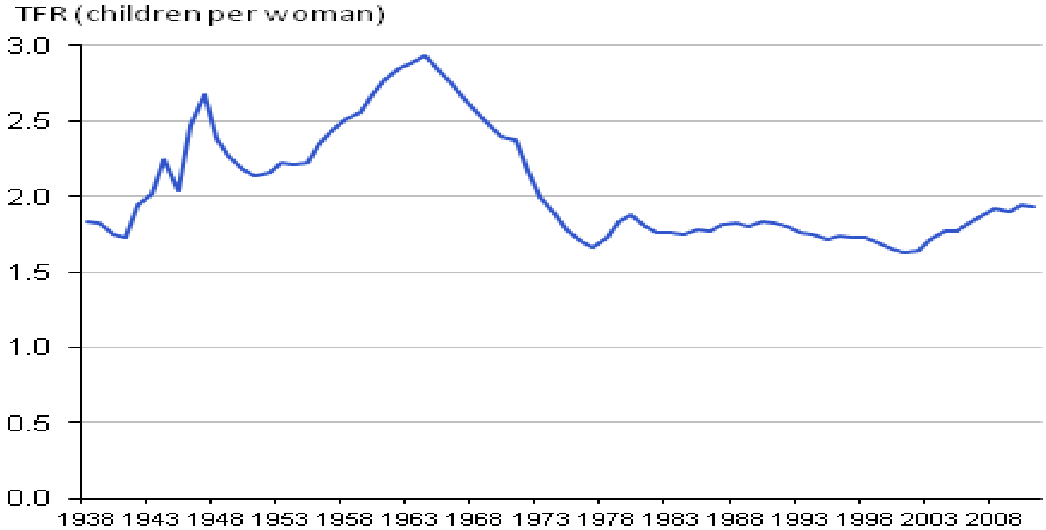


FIGURE 2.1: Total Fertility Rate for England and Wales

Source: Office for National Statistics, 2013

By the mid-1960s, most of the conventional and well-established family ideals were eroded as a new wave of social class emerged in the workforce in Western Europe. The notion of a nuclear family, with the male member of the family as the main breadwinner and the woman attending to the domestics, soon gave way to an era of ‘social equality’ (Kiernan et al., 1998). This trend was not merely a self-fulfilling phenomenon. There were economic pressures to absorb more people into the labour force in Post-War Europe, as the continent had lost a significant proportion of its working population in the war. Single mothers that lost their husbands in the war had a compelling economic reason to want to enter the labour market in order to cater for their families. This economic phenomenon was further augmented by the widespread use of contraception, family planning and sexual education. Consequently, young adults were able to decide the timing and the size of family they would eventually have. However, economic premise was soon compounded by other socio-cultural trends, like family patterns (such as lone parenthood), living arrangements, urbanisation, globalisation, and widespread accessibility of modern healthcare services, all of which have influenced the demography of Post-World War United Kingdom until present time (Rees et al., 2013).

One of the most compelling challenges governments and policymakers face globally is the balancing act of sustaining economic growth and overall social prosperity through an efficient and active workforce capable of self-regeneration and funding public social expenditures, including pensions. However, in the advent of the baby boom years, the latter part of the twentieth century has seen an encouragement of earlier exit from the labour force by older workers, especially in physically demanding occupations like construction and mining, in order to absorb new entrants and younger people into the workforce (Bengtsson and Scott, 2011). This is compounded by a decreasing number of people in the working age group (15-64 years). For example, a research conducted by the International Labour Organisation (OECD, 2006), found that during the period 2000 – 2030, most industrialised nations will have experienced continuous decline in the population of their working age group; the population of this age group in the UK is expected to have shrunk by 6% in this period. These trends are further exacerbated by a steady increase in average life expectancy in OECD countries, which is currently 80 years: this is an increase of 10 years since 1960. Consequently, the number of years older people are expected to spend in retirement has increased significantly – for men and women from 11 and 14 years respectively in 1970 to 18 and 23 years respectively in 2004 (ILO, 2006). Hence, in most industrialised nations, where the overall ageing population has resulted in a steady increase in the median age of the labour force, retaining people longer in employment will prove beneficial for individuals as well as for society as a whole (OECD, 2013). Another study of the projected demographic structure within the EU found that whereas in 1960 there were 3 children (age 0-14 years) for every older person (age 65 and above), by 2060 there will be more than 2 older persons for every child (OECD, 2006).

The median age in most industrialised nations has been increasing steadily since World War II. A prominent example is Japan, where the median age is expected to reach 54 years and overall (male and female together) life expectancy has exceeded 83 years (Eberstadt, 2011). While Japan is extreme in comparison to other industrialised countries, demography trends in the UK show a similar pattern. Prior to the enactment of the Equality Act 2010, workers in the UK were expected to retire once they become 65 years of age (default retirement age, DRA). However, effective 6 April 2011, workers can no longer be compelled to retire against their will (Lanzieri, 2011). While a number of studies suggest that the UK population has been ageing for well over a century (www.legislation.gov.uk, 2011), research into the socioeconomic impacts of the country's ageing population have only become prevalent in the last few decades. A recent study projected that there will be 51% more people age 65 years and over in England in 2030 compared to 2010, while well over 10.7 million people are currently expected to retire with inadequate pension incomes given current ageing and other socioeconomic trends (ONS, 2011). Hence, the proportion of the 50-64 years age cohort in the UK workforce is expected to increase from 12.8% in 1992 to 17.8% in 2033 (www.parliament.uk, 2013). There is overall consensus among researchers, policymakers and other stakeholders and interest groups that UK society is underprepared for the ageing population and that the inherent opportunities that can be derived from the ageing phenomenon will be lost as more and more workers are forced to make the choice between earlier retirement and inflexible work conditions (ONS, 2010).

Against low mortality and fertility rates for most of the twentieth century, the UK population has increased by 50% from 42.1 million in 1911 to 63.2 in 2011 (Thomas et al., 2008). In 2013, the total UK population was estimated to be 63.7 million, and it is projected to reach 73.2 million, by 2035 (Arman et al., 2009). These trends have been further augmented by a gradual increase in the median age from 25 years in 1911, to 35 years in 1961, and then to 39 years in 2011 (ONS, 2013b). It is estimated that the median age will reach 42.2 years by 2035, which is an increase of 2.5 years compared to 2010 level (ONS, 2011). The proportion of people aged 65 years and over is expected to increase from 17% in 2010 to 24% in 2051 (Arimah, 2000). Life expectancy at birth for females and males is currently 82.6 years and 78.7 years, respectively, while life expectancy at age 65 years has risen by 18.2 years for men and 20.7 years for women in the 30 years between 1980-1982 and 2010-2012 (Winston, 2014). A report by ONS (2013a) suggest that at the current demographic trend, one out of every three babies born in 2013 is expected to live for one hundred years. The same report confirmed that in absolute terms, the total number of centenarians will increase eightfold from 14,000 in 2013 to 111,000 in 2037.

One of the key indicators of the capability of a population to support its economically inactive age cohort is the dependency ratio. For example, the old age dependency ratio (OADR, Figure 2.2) depicts the number of older people that are ‘supported’ by the working population group. The OADR is usually computed as the number of people at the state pension age (SPA) and above against every 1,000 people of working age group (usually between 15 years and State Pension Age: SPA).

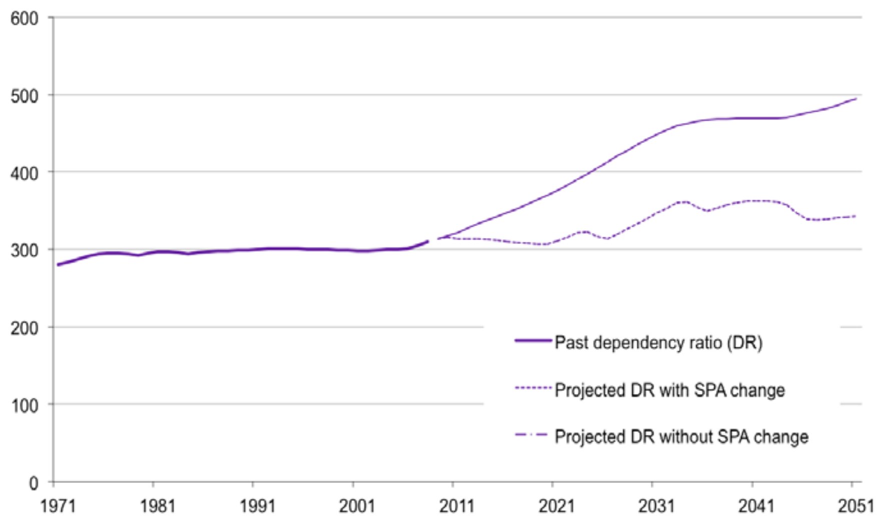


FIGURE 2.2: Old Age Dependency Ratio, Historical and Projected
Ratio per 1,000 People of Working Age

Source: Office for National Statistics, 2012

While ageing in the UK population has been persistent over the last century, the OADR has more or less stagnated at around 300 people for every 1,000 people of working age group in the 30 years preceding 2011, as illustrated in Figure 2.2. The main reason for this stagnation is the positive effect of net migration. To date, the net impact of inflow and outflow of migration has offset the consequences of increasing life expectancy and the overall ageing of the population. However, the lasting impact of this mitigating phenomenon cannot be precisely predicted. As Figure 2.2 shows, even after correcting for changes in the SPA (effective 2011), OADR will continue to increase between 2011 and 2051, during which time most of the members of the baby boom generation are expected to retire. However, without any changes to the SPA, the OADR would have soared to 492 persons for every 1,000 persons in the working age group by 2051 (Arthur, 2009).

Whereas these trends have given rise to recent governmental measures to address socioeconomic challenges of an ageing population through pension reforms and the phased increase of the state pension age (SPA) (www.parliament.uk, 2013) a recent report by the House of Lords' Committee on Public Service and Demographic Change, has concluded that both the government and the society as a whole are "…woefully underprepared…" for an ageing population, and the resultant boon that old age brings may be lost forever, without urgent actions (www.parliament.uk, 2013).

A careful examination of the UK demographic trend Post-World War II suggests that four main interrelated developments have played crucial roles in the evolution of the UK's population, all of which are expected to persist in the coming 20-30 years. Firstly, total fertility rates have been low, staying below the replacement fertility level of 2.1 children per woman. Secondly, the exception to low fertility rates in the Post-war period was the baby boom experienced mostly in the 1960s (Figure 2.1); while this in itself impacted positively on the UK workforce between the 1970s and the first decade of the millennium, the impending retirement of this age cohort may negatively affect the old age dependency ratio, which neither the increased SPA nor the net effect of migration will be able to offset. Thirdly, notwithstanding the continuous decrease in the UK fertility rates, net positive migration now accounts for about 50% of the annual increase in UK population as of 2010, while some of the natural reproduction births have also been attributed to the effect of net positive migration, as immigration is usually concentrated at younger age (www.parliament.uk, 2013). Lastly, the widespread accessibility of healthcare services has impacted positively on life expectancy, which is expected to further increase in the coming decades.

It is evident that all these factors pose a demographic dilemma in the sense that they are interrelated and mutually reinforcing; however, the policies being implemented to address them, albeit not necessarily popular ones, may not be sufficient to fully derive the benefits of an ageing population and assuage the challenges therefrom. Furthermore, while the increase in the SPA is already an indication of policymakers' recognition that people will have to work longer, very little has been done to actually ensure the physical work environment is capable of accommodating the older age cohort of the workforce. A concerted effort is required from all stakeholders, including government, employers, and society, to address the pressing issues of the demographic phenomenon. The overarching objective of this research is to gain a better understanding of these issues that impact mostly on older workers in the built environment, and develop a framework to support older nurses in their workplace.

2.5 Gerontological Contexts

According to Flatt (2012, p. 1.) ageing can be defined as "…an age-progressive decline in intrinsic physiological function, leading to an increase in age-specific mortality rate and a decrease in age-specific reproductive rate". Kirkwood and Franceschi (1992, p. 412) take a rather controversial stance, by warning against the idea that "…ageing is programmed as an active process of self-destruction in the organism". Simply put, ageing is a natural process of development between birth and death. However, the period between birth and maturation is usually referred to as *Growth*, while post maturation period is what is usually defined as *Ageing*. Maturation itself is the stage of human development, which is preceded by the adolescent period during growth. Adolescence, on the other hand, is the stage of human development that a member of the population becomes capable of biological reproduction. Nair (2005) proposes that the human ageing process starts at 30 years, which marks the onset of a decline in the musculoskeletal strength of the human body and the physical capabilities of the body begin to diminish. It is the process of "…unfavourable change, correlated with the passage of time and which becomes apparent at the maturity…" (Lansing, 1951, p. 274). These may have direct implications on the sensory organs, flexibility, dexterity, as well as longer response times. It is conceivable that all of these life stage conditions may not be attributable to any period in the human life span and hereditary as well as environmental conditions may influence this process. A more comprehensive definition may thus be that ageing is the advent of the decline in the physical cognitive, sensory, emotional, physiological, and psychosocial conditions of an individual, which may, or may not, be attributable to a particular stage of their life course, and whose intensity and manifestation may be person-specific and vary over ethnicity, gender and cultural background (Ryan and Coughlan, 2011). On the life course continuum spanning birth and death, the focus of this section of the literature review is the pre-retirement stage of people's life experiences and their choices, as this will be shaped by their physical and social environmental factors. This will be presented through discursive exploration of successful ageing, the life course phenomenon and literary treatise of environmental gerontology.

2.5.1 Successful Ageing

There is an emerging school of thought that advocates for 'successful ageing', which posits that there is more to passage through life than just 'ageing' (Rowe and Kahn, 1997). Rowe and Kahn (1997) suggest three conditions for successful ageing, namely, (i) disease and disability avoidance; (ii) engagement with life; and (iii) high cognitive and physical function. A study conducted to determine predictors of successful ageing used mobility and other physical activities as test measures (Strawbridge et al., 1996). Menec (2003), while abstaining from offering a definition for successful ageing, draws parity between “successful ageing” and “active ageing”. She suggest that actively ageing would include all spheres of physical and social activities, which would, invariably lead to wellbeing and life satisfaction. It is presumed that social activities would always embody some degree of physical activities; therefore, activity levels are a predictor of functional and cognitive health (Garfein and Herzog, 1995).

Baltes and Baltes (1993), on the other hand, point at the paradox of ‘successful ageing’, arguing that whilst there is a positive connotation to ‘success’, ‘ageing’ had been attributed to a period of decline. This may suggest the incompatibility of ‘ageing’ and ‘success’. Successful ageing have been said to emanate from the need to distinguish between pathologic and normal ageing (Schulz and Heckhausen, 1996). Such distinction implicitly account for illnesses that might affect a person’s performance, subjective wellbeing and potential in case of pathologic ageing. However, the definition of ‘normal ageing’ is subject to further clarification. Schulz and Heckhausen (1996) group ‘normal ageing’ individuals into two groups: the first are those without any form of illness or infirmity, i. e. the ‘usual agers’. The other group of ‘normal agers’ are individuals who have shown little decline in function relative to their younger counterparts, whom they have termed the ‘successful agers’. For decades, empirical investigations into the concept of ageing discourse have been dominated by researchers who attribute it to changes in physiological functions of an individual (Rowe and Kahn, 1987). For instance, Phelan et al. (2004) view successful ageing as the ability of an individual to demonstrate positive characteristics in their health status encompassing their physical, functional, psychological, and social constructs. In such a disparate discourse, it does seem that there is very little agreement among researchers on what constitutes ‘successful ageing’.

2.5.2 The Life course phenomenon

What is clear is that between the time of birth and death, human beings undergo various changes. Therefore, it is almost impossible to engage in any gerontological discourse of ageing without touching on the notion of the “life course”. Life course is a socially constructed milieu characterised by identified stages of human development. Hagestad and Neugarten (1985, p. 35.) opine that life course “…emphasises the turning points when the social persona undergoes change…in age-related transitions that are socially created, socially recognised, and shared”. In this respect, some authors suggest that the life course is a branch of the sociological study of ageing, stratified into stages differentiated by certain rights, privileges, norms, expectations and obligations (Elder and Rockwell, 1979; Moen, 1996). Life course is neither a new phenomenon nor genre of the study of human life stages. Rooted in the psychological study of ageing, the term “life span” is usually presented as an antecedent to “life course”, which has been previously used to depict the study of the various stages of the ontogenetic growth of human development (Bengtson and Allen, 1993). Recent contributions made by sociological perspectives of human development have brought the term life course into mainstream scientific discourse. The study of life course requires longitudinal approach to study and understand stages and trajectories of human developmental pathways (Elder Jr et al., 2003), starting from the early infancy (McAdams, 2015), through adolescence (Clausen, 1991), adulthood and middle age (Turrell et al., 2002), the post retirement period (Hayward et al., 1998), up until the oldest old (Gwozdz and Sousa-Poza, 2010), i.e. people in their 80s and above. Against this backdrop, it is important to note the differences and the interplay between physiological ageing and the social determinants of ageing (Fontana, 1977).

As people age and ‘develop’ into their social environment, their options and decisions are shaped by time and timeliness. The sociocultural structure of the community ‘dictates’ when and how these options and decisions are experienced. For example, in the long and uneven transition to adulthood, there are socially constructed “markers” that expect people to undergo formal education, learn a trade, start a fulltime job, leave the home of origin, get married and start rearing their own children (Shanahan, 2000). While these stages would be formed and shaped by certain social “standards”, which are the norms and expectations discussed above, there are also individual, “non-ontogenetic” aspects of the life course that would affect such life experiences, constructed by individual values and beliefs. In Western cultures and most modern traditions, these social norms have been structurally constructed and are supported by legal frameworks. What is important from the perspective of this study is to understand the role individual circumstances play in life course trajectories, with a special focus on career and work ability.

A number of studies have demonstrated the essence of ‘self’ as an individual relative to their work, as socially perceived and interpreted through the cultural lens (Westerhof et al., 2003). Schwartz (1999) suggests that the meaning individuals attribute to work is based on the cultural values of work. Other researchers have established the resultant impact of socioeconomic background on an individual’s cognitive function, and by extension, on career prospects (Singh-Manoux et al., 2005). Another key determinant of late life cognitive functioning is the sensory construct (Lindenberger and Baltes, 1994; Heyl and Wahl, 2001). More importantly, studies have shown that childhood socioeconomic status contributes to brain development and is a key determinant of cognitive achievement in life. It has also been proposed that socioeconomic status is a predictor of mortality and morbidity rates in the society (Claussen, 2015), which can also be used to predict longevity (Ferrie and Rolf, 2011). Low socioeconomic status has been associated with poor physical functioning, including mobility in middle age men and women (Laaksonen et al., 2007). Maintaining regular physical activities supports older people’s functional abilities, wellbeing and independence (Shephard, 1997). Overall, there is a direct correlation between socioeconomic status and health outcomes (Anderson and Armstead, 1995). What is unequivocal in all these studies is that life course and the pathways to work may not necessarily be a case of individual choices or preferences, but a result of given family background, which may be shaped by individual crossroads decisions. However, studies do suggest that economic hardships experienced during the active career period may contribute to the prevalence of difficulties undertaking activities of daily living in older people, such as walking, eating, dressing, and using the toilet (Lynch et al., 1997).

2.5.3 Environmental Gerontology

Most studies in gerontology regard ageing as a process, *not* a stage (Cumming and Henry, 1961), taking into account all the stages of the human life span (Lawton and Rich, 1968). In a broader sense, gerontologists are primarily concerned with the physical, social and psychological environments of ageing (Peace et al., 2007). However, some studies have recognised the complexity related to the ageing process. The way genetic and environmental factors combine to influence the ageing process is unique to every individual (Cutler, 1975). Wahl and Oswald (2010) for instance, noted that older people face a challenge to continuously adjust their relationship to the physical and psychosocial environments which they inhabit. Likewise, Golant (2003) observed that in order to create a 'befitting' environment for older people, environmental designers must be cognisant of the temporal properties of the built environment and how older people use, manipulate or perform tasks in those settings. A stage in the life course on which the physical environment has a profound influence is old age. A branch of gerontology that studies the interplay between older people and their physical and psychosocial environment is *environmental gerontology* (Kendig, 2003). Environmental gerontology is defined as the study of the "…description, explanation, and modification or optimisation of the relation between older people and their socio-spatial surroundings" (Wahl and Weisman, 2003, p. 161). Environmental gerontology has been tasked with the responsibility of studying, understanding, and proposing adequate interventions to the environment that could improve the quality of life of older people (Geboy et al., 2012) in the context of an ageing population. These solutions must consider the broader, macro perspectives of older people's environment such as urban and neighbourhood planning (Phillipson, 2004) and the immediate, micro environment, such as housing design (Gitlin, 2003). As older people spend a significant proportion of their time in a residential setting (Tinker, 1997), proponents of the advancement of environmental gerontology in this direction support evidence-based housing solutions for older people (Hillcoat-Nalletamby et al., 2010).

This raises the question of space familiarity and attachment. Rubinstein and Parmelee (1992, p. 139) suggest that "…attachment to a place is a set of feelings about a geographic location that emotionally binds a person to that place as a function of its role as a setting for experience”. There are several benefits of space attachments and ageing in place (Wiles et al., 2011). Attachment to a familiar environment in older people has been found to be a source of reaffirmation of self-identity and security, rather than withdrawal from social networks (Cookman, 1996). Hence, place attachment and sense of belonging become crucial for older people (Wiles et al., 2009), as reduced physical and psychosocial competences may be compensated for through place familiarity (Means, 2007). Personal space and the ability to control one’s environment has been shown to be a sign of a person’s existence, without which a sense of wellbeing may be lost, resulting in both physical and psychological decline in older people (Werngren-Elgström et al., 2009). Likewise, such attachments to a particular environment may result in deterioration in autonomy for older people if their competence and/or the environment in which they are situated changes. In a broader sense, a strong attachment to a place may be perceived to “…represent a resource for life satisfaction against the experience of decreasing health…” (Wiles et al., 2012) concomitant with older age. An older person may need to realign their behaviour in order to re-establish congruence between their environment and their personal competence. Such an adaptive strategy has been suggested to impact on self-identity (Scheidt and Windley, 2003). However, it must be appreciated that it is not always possible to maintain a stable environment. There will be instances when inevitable developments in an environment will lead to unfamiliarity of place for an older person. Older people can reinvent a sense of space through “…the aesthetics and the usability of the environment as well as through shared memories…” (Oswald et al., 2011). The built environment must be planned and designed so that it accommodates the possibility for such reinvention in later life.

2.6 Person-Environment Interactions

Man in his ‘indisputably’ assumed position at the pinnacle of all ecological relationships, is in a continuous quest to explore and influence his natural environment – for a number of reasons (Klausner, 1971; Boughey, 1971). At the heart of this ambitious quest is the need to survive. That is why in ecological terms, the supremacy of the human species is at least contestable. One of the earliest theories to study the relationship between an organism and its environment is the ‘niche theory’ (Vandermeer, 1972). Hirzel and Le Lay (2008) distinguish between two concepts of niche theory. The first relates to how the species is situated within its abiotic environment, without the need for emigration, as proposed by Grinnell (1917). The second is the relationship of the species to its biotic environment, as proposed by Elton (1927). The theoretical premise of this PhD study is in line with the ‘Grinnellian niche theory’, which purports to explain the relationship between an organism and its physical environment, by establishing the fitness of the individual species to that environment. This transcends the predatory nature of an organism, and thus includes its adaptive abilities to survive in its natural habitat (Brandon, 1978), in pursuit of limited and diminishing resources, however uncertain the outcome of such a ‘coping strategy’ might be (Campbell, 1983). Niche theory posits that species with identical niche characteristics cannot survive in the same place at the same time (Bazykin, 1969) due to competition for resources, as the more adaptive and more competent ones would 'prevail' (Pianka, 1981).

The quest of man to survive in his natural habitat 'without the need for emigration' may be accountable for the creation of the built environment, to shield man from actual or perceived threats from the natural environment (Lawrence and Low, 1990). In man's attempt to erect this protective fabric, the built environment also, invariably, constitutes a physical barrier that must be overcome during everyday activity. It is presumed that the human body and the built and natural environments are in constant interaction with each other because a person is either in one or the other and there is a continuous and conscious or subconscious interaction between the person and environment (Suresh et al., 2006). A modern derivative of the 'Grinnellian niche theory' is the person–environment fit (P-E fit) theory, which was first proposed by Lewin (1951). Taking this line of the niche theory further, Lawton and Simon (1967) purport that a person may manipulate or arrange the physical space such that there is either an active or passive interaction between the person and the physical environment. In an active interaction, one arranges objects and alters the environment such that they meet the needs of the person; whereas, in a passive interaction, the person alters their behaviour so as to overcome the challenges of the physical environment. In the context of this research, the P-E fit theory is more relevant to the study of person-environment interactions because of its bearing to the built environment and its focus on older people.

2.6.1 Person–Environment Fit Theory

In the study of person-environment interactions, the P-E fit is the most commonly applied theory (Lien, 2013; Cvitkovich and Wister, 2001; Yang et al., 2008). Most studies have sought to discuss P-E fit theory from a number of perspectives, some focusing on the person, in terms of personality or personal traits (Kieffer et al., 2004; Sturaro et al., 2008), others on the environment, with respect to environmental factors (Schneider, 1987), while more nuanced studies looked at the interactions or transactions between the two (Oswald et al., 2003; Iwarsson and Stahl, 2003). Beyond its application to understand the interactions between the 'person' and the 'environment', P-E fit has also been used in various disciplinary settings, including environmental psychology (Pervin, 1987; Moore et al., 2003), human resource management (Hansson et al., 2001; James et al., 2011), education and vocation studies (Moos, 1987) and environmental gerontology (Oswald et al., 2005; Phillipson, 2004).

Lawton was one of the pioneers of the study of P-E fit and its application to the built environment, especially with respect to housing for older persons (Lawton, 1970; Lawton, 1977). In earlier studies, Lawton proposed an ecological model named the '*environmental docility hypothesis'*, which suggests that an individual's behaviour coming in contact with an environment is relative and the analysis of such behavioural response cannot be based solely on our knowledge of the person or the environmental stimulus, but on the prevailing transactions between the two components in P-E fit (Figure 2.1). On the horizontal axis, 'environmental press' constitutes all factors that influence a person's behaviour or circumstances a person may wish to cope with. On the vertical axis, 'competence' refers to the level of the person's physical, cognitive, social or emotional capabilities.

The environmental docility hypothesis states that the more competent a person is, in terms of their "…health, intelligence, ego strength, social role performance or cultural evolution…", the more capable they are at overcoming environmental demands (Lawton and Simon, 1968a), such as performing typical activities of daily living (ADL) including mobility, self-care and the management of social relationships (Barer and Nouri, 1989). This hypothesis further suggests that a high degree of competence results in the person being able to rise over environmental conditions, while decreased competence or "deprived status" will invariably increase dependency on environmental circumstances in order to remain "functional" within the same environmental setting. The central question that this hypothesis postulates is how the built environment influences the ability of older people to pursue independent ADL (Werngren-Elgström et al., 2009). Underscored by the premise that socio-environmental constructs are of great significance in an older person's ability to maintain healthy and independent living, Lawton used the environmental docility hypothesis to lay the foundation for subsequent studies in the support or restriction afforded by the built environment with respect to older person's ability to sustain social relationships in the environmental gerontology discipline (Lawton, 1974).

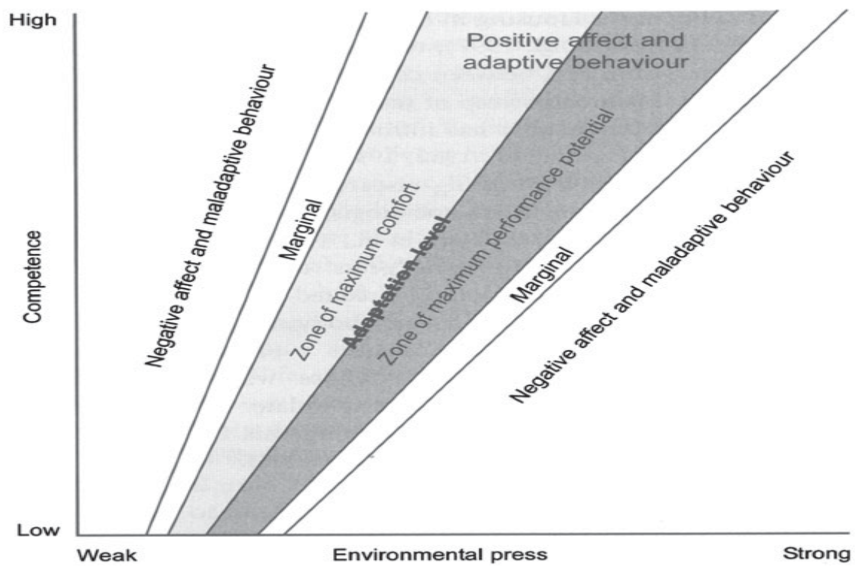


FIGURE 2.3: Lawton and Nahemow's Ecological Model
Source: (Lawton and Nahemow, 1973a)

According to Dunn et al. (1994, p. 595.), a person's behaviour or response to the environment must be assessed in a socio-ecological context, in the sense that "…the physical environment as well as the social, cultural and temporal factors all influence behaviour". In the context of this research study, the environment should be considered not just as any man-made alteration to the natural environment, but to include socio-cultural constructs afforded by the micro and macro environment, as this presumption is expected to provide a broad theoretical foundation to this research study prior to delimitation and contextualisation.

Many other studies of person-environment interactions have demonstrated that the management of tension by an individual depends on their social and cultural setting (Lazarus and Launier, 1978). For example, Lewin (1939) suggested that how a person responds to environmental changes or challenges varies depending on their individual social or cultural settings. Most of this research has displaced previously misrepresented suppositions that human behaviour, personality and emotional expression cannot be studied in a 'closed system', and as such, an individual's response to environmental stimuli, either as a result of directed action or an emotional expression, cannot be scientifically predicted (Ajzen and Madden, 1986). Conversely, notwithstanding a person's physiological capability to alter the environment in order to favour their particular circumstances, Pervin (1987) suggested that, under certain conditions and assuming a constant level of a person's competence, an individual may react to the same environmental stimulus or situation differently, at different occasions; and thus their behavioural responses to their environment may not be constant over time, and as such are not necessarily predictable. Some of these earlier studies have laid the foundation for the better understanding of the person, the environment and the interaction between the two.

Pervin (1987) noted two approaches to discussing person-environment interactions: the first seeks the relationship between a person's needs and motives and the opportunities or barriers presented by the environment; the second relates to a person's aptitude and skills to task demands. These propositions bring to the fore other underlying psychological and psychosocial factors that affect how people interact with their environments.

In the first instance, a person may respond to environmental stimuli based on their individual momentary needs, cultural values, self-esteem, motivation and their prevalent social conditions, including their objective and/or subjective relationship with other members of their immediate environment. All these factors constitute a complex system of psychosocial and psychological personal characteristics, which determines how a person may respond to environmental demands. Consequently, the person's response to such demands could change, as their real or perceived social status changes over time (Maslow, 1943).

As for the second approach proposed by Pervin, an individual's response to environmental demands may be task driven, i.e. the challenge posed by the environment determines an individual's approach to solving the tasks. However, an adequate level of competence is a prerequisite for tackling tasks and surmounting environmental challenges. In the absence of appropriate behavioural competence or adequate psychosocial constructs, people may, otherwise adapt to the prevailing environmental stimulus in order to resolve person-environment interaction mismatch (Slangen-de Kort et al., 1998).

A trail well defined in P-E fit literature is the person-environment congruence concept, which advocates that neither personal traits nor environmental factors has a dominant effect on resultant behaviour in the person-environment interaction (Muchinsky and Monahan, 1987), but the transaction between the two sets of variables impacts positively or less desirably on attitudes, behaviours and wellbeing. Another subset of P-E fit theory suggests that under natural circumstances, an individual's perception and interpretation of the environmental stimulus determines, to a great extent, their behavioural response (Magnusson and Ekehammar, 1978). Furthermore, there is a school of thought that contends that, even where there appear to be a congruence in the person-environment interaction, people will, over time, interfere with environmental settings (Kulik et al., 1987), to make adjustments and may create an unintended misfit. This proposition, thus, underscores human natural tendency to *influence* their environmental conditions in pursuit of harmonious relationship between the person and the environment and predominate natural settings (Ehrlich and Ehrlich, 2008). However, it is noteworthy that person and environment variables must be considered in a broader sense to include factors such as behavioural competence, psychological wellbeing and perceived quality of life, for the person, and cultural, social and psychosocial settings, for the environment, all of which are potent factors that contribute to the behavioural system in person-environment interactions (Lawton, 1983).

The most common stance in all these approaches is to substantiate the underlying 'misfit' in person-environment interactions through empirical studies (Blau, 1981) or conceptual theoretical formulae (Bretz and Judge, 1994). It is therefore important to first understand what the natural dispositions of the person variables and the environment variables are in absolute and independent terms, as well as relative to, or as a function of, each other. Guidance can be sought in the explanation offered by Edwards et al. (1998), whose work depicts the P-E fit in relation to stress. Building on the core premise that a misfit between the person and the environment may result in stress, Edwards and his colleagues contend that "…stress arises not from the person or environment separately, but rather by their fit or congruence with one another" (Edwards et al., 1998, p. 2.). In other words, this study implicitly suggests that stress may not occur where there is a perfect match between the person and the environment. However, such a generalisation of this research finding is questionable. Identifying this ambiguity, Edwards et al. (1998) offered two approaches to contextualising this seemingly simplistic stance.

First, in the P-E fit theory, the representation of the person and the environment can neither be absolute nor obtuse; hence these two variables may either be objective or subjective. The ***objective person*** refers to the person as they are, including their innate attributes and characteristics, while the ***subjective person*** indicates the person's perception of these personal traits. Likewise, the ***objective environment*** depicts the physical and social constructs of the environment, irrespective of the person's perception, whereas the ***subjective environment*** signifies the person's interpretation of the environmental settings and situation. These representations are supported by earlier studies in the field of environmental psychology. For instance, French and Kahn (1962, p. 3.) distinguish between the objective environment and the psychological environment, suggesting that a "…person's contact with reality is indicated by the degree of correspondence of the psychological environment with the objective environment." In as much as the psychological environment in this context is the *subjective environment,* "reality" can be interpreted here as the *objective environment*, as proposed by Edwards et al. (1998). In this explanation, therefore, it may occur that, regardless of the actual stimuli exhibited by the environment, a person's (subjective) interpretation and perception of these environmental variables is what causes stress and not the *actual* objective environment.

The second explanation offered by Edwards et al. (1998) is that in the person environment interaction, the person is presumed to possess a number of personal motives and values (collectively ***needs***) as a result of their socio-cultural background and life experience, which interacts with the opportunities and resources (collectively ***supplies***) offered by the environment to satisfy those needs. Furthermore, the environment may place certain barriers and challenges (referred to as ***demands***) on the person's aptitude, skills and strength (referred to as ***competence***). Hence, the P-E fit approach to stress characterises stress as a lack of correspondence between the person's needs and competences and the environment's demands and supplies, respectively (Edwards and Cooper, 1990). However, the environmental challenges may exceed a person's capability, or the person's response may exceed the environmental demands, which may subject the person to undue stress. Nonetheless, it is noteworthy to reiterate that while a misfit in the interaction between any of the variables of the person and environment may result in stress, the use of this causal-affective relationship is intended for analogical purposes only by the authors.

The question thus arises, that in the event of a misfit between the person and the environment, what methodological approaches are available to resolve the misfit. There are two broadly used strategies by an individual to negotiate P-E misfit. One is the ***coping*** strategy (Baker, 1985), in which the individual advocates improvement to the objective P-E fit, by making adjustment to the objective person or the objective environment, either by changing their competence/needs or enhancing the demands/supplies of the environment. The other approach is the **defence** strategy, whereby a person facilitates the subjective P-E fit through cognitive distortion (i.e. denial of reality or repression of motives and values), or the person recognises the prevalence of the P-E misfit, but dismisses the resultant consequences of such dissonance (Furnham et al., 2003).

This theory of P-E fit, however, does not offer a complete and precise conceptual framework for its application and, most importantly, the methodological approaches are at least inconclusive. For example, assessing the dimensions of the person and environment variables in the aforementioned subsets of P-E fit theory may be very cumbersome, and as such, their degree of correspondence to one another may not be adequately appraised. In order for the P-E fit theory to offer an acceptable conceptual framework, the variables of the components in the person-environment transactions must be independently measurable. However, quantifying even the most *objective* character traits or environmental stimuli can be a daunting task, so is appreciating the breadth and depth of the interactions between them. Consequently, predicting what permutations of each component's variable may induce a behavioural pattern requires further elements.

In spite of these shortcomings, the foundation Lawton laid down has given rise to newer branches of environmental gerontology, namely *gerontechnology.* Gerontechnology is aimed at using technology to solve the problems and challenges of older people. Bouma et al. (2007, p. 190.) define gerontechnology as a discipline that harmonises "…two separate developments in the present society: the increasing number of older persons, called the ageing population, and the technology innovation of products and services, called the digital era…". For example, (Pinto et al., 1997) suggest that an older person's home environment may be upgraded with the aid of new technology in order to support the person's autonomy and healthy ageing. However, the older person must be able to learn to manage the newly upgraded home environment.

2.6.2 Adaptability of P-E Fit Theory

The P-E fit theory has been widely used to explain the interactions between older people and the physical, psychological and psychosocial attributes of their environment, including the built environment. French and Kahn (1962, p. 3.) proposed a broader understanding of the environment, to include housing, transport, outdoor environment and other community and public places. The P-E fit theory has been put to practical use in the assessment of the accessibility of housing for people with functional limitations. For example, Iwarsson (1999) developed the Housing Enabler as a tool for occupational therapists to be used in the assessment of the ability of people undergoing physical rehabilitation in the home environment. While the original 'Enabler' concept originates from Steinfeld (1979), the central tenet of the Housing Enabler derives from the P-E fit theory, as suggested by Iwarsson et al. (2012, p. 517): "…the methodology rests on Lawton's and Nahemow's ecological model, with accessibility defined as the relationship between the individual's functional capacity and the demands of the physical environment". This tool was later adapted for use in housing provision for older people (Iwarsson et al., 2005).

While the P-E fit theory is usually used to describe an older person's ADL within a residential setting in the built environment, there is paucity in its application in the relationship between *older workers* and *work environment.* This PhD research study, on the other hand, will look at the ability of older workers to function in a workplace and the support that may be afforded by the built environment in so doing, by applying the P-E fit. This PhD study has identified that the P-E fit theory may be adapted from the environmental gerontology discipline and form the theoretical context in the discourse of older worker and the work environment in this research project. One of the challenges of an ageing population is that people are expected to work for longer than previously experienced and due to the need for people to spend more time at the workplace than ever, a few researchers are beginning to appreciate the importance of person-environment interaction in the context of the workplace (Perry et al., 2012). It is now conceivable that the design of the built environment can be used to enhance older workers functional capacity at work, just as the design of the home environment can be used to improve the independent living of older people (Iwarsson and Stahl, 2003). In fact Clarkson and Coleman (2015) claim that a person's environment may be enabling (i.e. barrier-free and supporting) or disabling (i.e. obstructive and impeding), depending on the demands it places on its users.

The degree by which design features of the built environment support a person has a telling impact on the individual's functional capacity. A proper fit will be achieved if environmental attributes facilitate the activities for which spaces were designed. Indeed Heerwagen et al. (1995) suggests that the way to tell if there is a "fit" or "misfit" between a person and the environment is by developing measurable indicators. This means that the notion of a "fit" or "misfit" in the P-E fit is tangible and transcends theoretical conceptualisation. An enabling environment will, therefore incorporate design features such as those proposed in the universal and inclusive design principles discussed in the following sections of this chapter.

2.7 Design Principles

Design principles and theories have evolved over the centuries (Lawrence and Low, 1990), and transcend human needs and design approaches used in the built environment. Design is a "…description of things that do not yet exist…" (Kalay, 2004, p. ix.) in the physical form. It is a preconceived map of how humans interact with the physical environment, by ensuring that such an encounter reduces effort, increases efficiency or serves other predetermined human purposes. Design derives essentially from humans' contemporary intellectual endeavour to benefit mankind in the areas of arts, science and philosophy (Phillips et al., 2011). Furthermore, the need for designing and implementing design principles emanates from the benefits afforded by the preconception of the interplay between humans and the physical environment. During these interactions humans employ the services offered by the physical environment. The use of the services offered by the physical environment may manifest in three different domains, products, processes or systems (Kusiak, 1999). The preconception of these interactions necessitates the need for design, such that a user's encounter with the physical environment is as seamless as practicably possible. This can be achieved if the interaction between the user and the three domains of the physical environment are flexible enough that it ensures access to the broadest user population, irrespective of their abilities, age, gender, or sociocultural background (Han and Moen, 1999). It is therefore important to understand the fundamental relationship between users and these domains of the physical environment.

A product may be in the form of goods and services, and may be designed with the preconceived intention for a particular or variety of uses or applications. Designers are aware that the first step to the delivery of user-friendly products is design (Simoni et al., 2003). Crucial decisions must be made at the design stage that may have irreversible consequences on the usability, costs and eventual disposal or disengagement from the use of the product or service. Designers' knowledge of the functionality of a product is the beginning of the design process. How users relate with, and use the product, including the 'intuitive learning process' of coming to grips with its basic functionality, must be facilitated and be part of the design process. Designer should ensure that users' experience of the use of a product is positive. The cost of acquiring and using the products must also be considered in the design process. If usability is achieved at an unaffordable price, then some groups of users may be excluded. Likewise, designers will be conversant with alternative ways of using and disposing of the products at the end of its useful life.

A process is a sequence of actions that is intended to result in specified outcomes. A user may be part of the process in order to benefit from its outcome, or may simply be a beneficiary of the process, without intense interaction. Whichever may be the case, process designers face the challenge of designing for a diverse population of users. Users coming in contact with a process are interested in its intended outcome and thus may have certain expectations that the design specifications must address (Hillier and Penn, 1994).

There is a natural tendency for human beings to vie for attaining a systemic equilibrium within the physical environment. Users interact with various elements of the physical environment in a systematic manner, that the nature of the environmental stimuli may soon become familiar and the corresponding response may be predictable. This continuous tilt towards a state of equilibrium is most evident in the ecological ecosystem, where all members of the system are mutually dependent on the activities of one another (DeAngelis and Waterhouse, 1987). Designers of a system of the physical environment would want to mimic such a symbiotic relationship between users and the designed system, ensuring that human interaction and exploration of the physical environment is as intuitive as it can be.

Central to the design of a product, a process or a system is information and its management. Iwarsson et al. (2007) identified two major challenges in designing the physical environment. First, the management of information required to deliver a user-friendly product, process or system may in itself be an emergent process, the outcome of which might be difficult to predict. Secondly, designers need to appreciate the self-organising processes and systems and the formal or intuitive learning process future users may have to undergo in order to understand how a product, process or system functions. A good design serves a purpose that transcends aesthetics. The starting point of good design is for the designer to have an in-depth knowledge of anthropometry, ergonomics and how human abilities may vary with age, disability, the environment or other circumstances (Pheasant and Haslegrave, 2005). This knowledge may be readily available, as part of the accumulated experiential knowledge of the designer, or it may be gained as part of the design procedure. Nevertheless, such information should enhance the thorough understanding of the interaction between humans and the physical environment. Ill-conceived designs, on the other hand, result in inappropriate products, processes and systems (van Aken, 2005).

There is a need for design to be understood as inseparable from barriers. Research have found that in some instances, the barriers created by the physical environment may actually 'disable' even so-called 'able-bodied' average users, who presumably do not have any disabilities (Frank and Kavage, 2009). In their interaction with the environment, humans and other living organisms encounter barriers on a daily basis. However, unlike other living organisms, human beings are capable of resorting to their intellectual resources in order to surmount environmental barriers. One such intellectual resource is the ability to alter the natural environment through design, with the very conception of the built environment borne by the need for shelter by early humans. While built structures provide shelter and safety for its inhabitants, it forms a barrier for unwelcome strangers and predators. The main goal of early 'designers' of the built environment, therefore might have been limited to mere survival, however, such alterations to the natural environment have evolved to pose some sort of unintended barriers to 'targeted' or arbitrary users. Today, design is an extension of man's potential to achieve his goals, through the creation of products, processes and systems in the physical environment.

Lawson (2006) suggest that in a typical interaction between users and any of the three domains of the physical environment, a user will be required to take three distinct, however, sequential functional actions; i.e. perception, cognition and motion (Figure 2.4). These are 'Prompt Sequential Reactions' (PSR) to environmental stimuli. First, an individual must be able to perceive or take in the information being disseminated by the physical environment. This means the information must be portrayed in an unambiguous form enabling visual or audible perception, as may be necessary. Secondly, the user should be able to 'process' such information in an intelligible manner, such that alternative courses of action may be identified. Thirdly, the preceding two actions must result in the intended course of motion (or motor) action. These series of actions by an individual coming in contact with any of the three domains of the physical environment will employ the sensory, cognitive and the physical abilities or resources of the user accordingly. Prompt Sequential Reactions can be described as a sequence of 'semi-automated' actions resulting from a person's contact with any of the three domains of the physical environment.

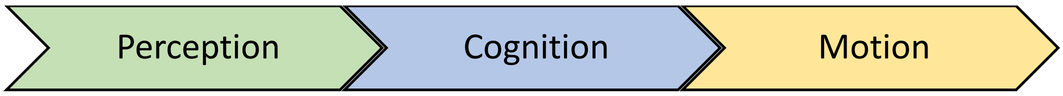


FIGURE 2.4: Prompt Sequential Reaction

Understanding the relationship between the perception-cognition-motion (PCM) reactions of humans to the stimuli of the physical environment is the premise for good design. Without a simple, yet effective, way by which to capture and describe the visual properties of an environment, it becomes not only difficult but also nearly impossible to apply empirical research to design processes (Story et al., 1998). Architectural research and design has thus begun to depart from mere geometric design of spaces toward a more holistic consideration of user perception and behavior in the context of the physical interaction between users and products (Boothroyd, 1994). The design of any product, process or system must consider a population of users on different levels of abilities in each and every one of the three actions in the PCM. For instance, Anderies (2013) suggests that older people may be less competent than younger adults in recalling the spatial map of their geographical environment.

Conventional design principles, invariably, attempt to offer solution to the needs of the mainstream users, usually referred to in everyday terms as an 'average user'. More recent studies into how these design principles have succeeded in fulfilling the needs of the broadest intended user groups have found that such a mediocre approach actually leaves a greater proportion of the population dissatisfied, as they do not provide sufficient flexibility across the population spectrum (Fine and Brinkman, 2004). This may lead to inefficient design that needs retrofitting of existing product, process or system, resulting in unforeseen extra costs for the operator and users of the product, process or system (Keates et al., 2000). The appreciation of the needs of a diverse population gave rise to a number of design approaches that foster the inclusiveness of previously marginalised user groups. Retrofitting design errors in order to suit the needs of people with reduced capabilities have been found to cause segmentation of the population. Such afterthoughts, may solve accessibility problem, but still render the physical environment 'unusable' to many people (Imrie, 2000).

Over the last few decades, a number of design approaches have evolved that are aimed at enhancing the usability of products, processes and systems by their target users. These design principles first challenged mainstream design approaches in the USA in the 1960s and 1970s and then later in Europe. The conventional design approach has been criticised for benchmarking its anthropometric design dimensions against the measurements of an able-bodied average male user (Jones, 2009). New design paradigms, on the other hand, were conceived out of the increasing self-consciousness of civil societies that demanded that the accessibility of public services should be commensurate with statutory citizenship, including social responsibilities (Ostroff, 2011). This civil self-consciousness later developed into various kinds of movements denoted as 'universal design', 'design-for-all', 'user-centred design', and 'inclusive design', among others. The growth in this kind of public demands led to inevitable promulgation of legislative frameworks and standards, such as the American with Disability Act in the United States (United States Department of Justice, 1990) and the Disability Discrimination Act in the UK (www.gov.uk, 1995). The main objective of these new paradigms of design is to support the design of products, processes and systems, such that they can be used by a diverse population of users with different levels of capabilities (Newell and Gregor, 2000).

2.7.1 Universal Design

The term Universal Design has long been used in the design literature and was first defined by Mace (1997, p. 1.) as "…the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialised design." While this definition might be the first to gain eminence in the accessibility design literature, virtually all the terms and keywords used by Mace (1997) require further clarification. The definition of "all people", the measurement of "the greatest extent" or the specification of "specialised design" all pose further ambiguity for designers less enthusiastic of the nuances of the accessibility of the physical environment. Undoubtedly, these design guidelines must be supported by appropriate legislation in order for them to become embedded in mainstream design practices. However, prior to the conception of this definition, the need to design for people with less than average capabilities was often presented in a stigmatising manner. Hence, the tactful and unobtrusive reference to usability by members of society, not belonging to the so-called mainstream, was novel in the context within which it was being used.

The Centre for universal design at North Carolina State University developed seven Principles of universal design (Figure 2.5). These principles are based on the fundamental anthropometric, ergonomic and ecological knowledge of human abilities and human interaction with the physical environment.

Designing to fulfil these principles requires the understanding of the spectrum of human abilities in all functional areas, including cognition, vision, hearing, body function, arm function, hand function, and mobility (Annandale et al., 1999). The following is a paraphrase of the universal design principles, as proposed by Newell et al. (2011):

Principle 1: Equitable use

The design is useful and marketable to people with diverse abilities.

Principle 2: Flexibility in use

The design accommodates a wide range of individual preferences and abilities.

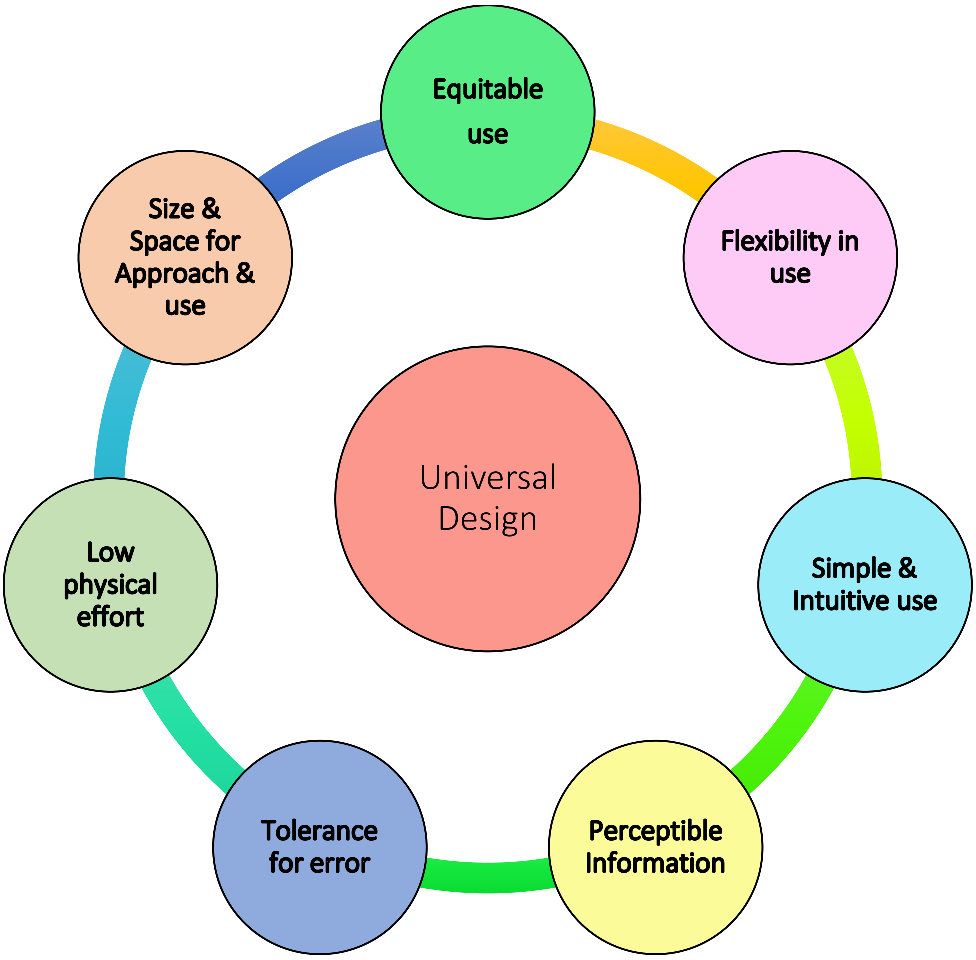


FIGURE 2.5: Principles of Universal Design

Principle 3: Simple and Intuitive use

The use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

Principle 4: Perceptible information

The design communicates necessary information to the user, irrespective of ambient conditions or the user's sensory abilities.

Principle 5: Tolerance for error

The design minimises hazards and the adverse consequences of accidental or unintended actions.

Principle 6: Low physical effort

The design can be used efficiently and comfortably and with minimum of fatigue.

Principle 7: Size and space for approach and Use

Appropriate size and space is provided for approach, reach, manipulation and use regardless of user's body size, posture and mobility.

In Europe, universal design first gained legislative status in 2001 (also known as Tomar Resolution), when these principles were introduced into the curricula of all occupations working on the built environment. Based on this a resolution was adopted by the Council of Europe, which, among others, invites members states to promote "…full participation in the life of community, which involves the right to access and to use and understanding of the built environment" (Council of Europe, 2001). The universal design principles cover other spheres of civic lives in the public and private domains whenever citizens come in contact with any forms of the physical environment. This universal design legislative framework is the first and most comprehensive guidelines for the implementation of universal design principles in the design of products, process and systems in Europe. Universal design, essentially is an endeavour by designers to ensure a product, process or system is designed in such a way that it suits the needs of a broad spectrum of users. This includes children, older adults, people with disabilities, persons of atypical shapes or sizes, individuals temporarily incapacitated due to injuries or illnesses, and people inconvenienced by circumstance (Story et al., 1998). Implementing the principles of universal design should not be seen as a piecemeal box ticking exercise by designers, but rather as a complementary and mutually reinforcing approach to fulfilling users' needs. This is particularly important as an individual may exhibit more than one of the characteristics that universal design principles is expected to support. For instance a middle age female user, who is deaf, poor at reading and pushing a baby pram will experience multiple challenges accessing a public building without lift. While it might be easier to enumerate the principles of universal design, applying them in practice is a conundrum exercise for designers.

However, other advocates of universal design have argued for a more subtle approach to defining the context within which universal design is being applied, recognising that it must be idealistic in its long-term objective but, nevertheless, realistic in its short-term achievements. For example, Mace (1997), posited that universal design should be seen by designers as a continuous process of improvement and must consider the resources available to achieve the ultimate long-term objective of inclusion. It has been found that a major hindrance to mainstreaming universal design principles is that designers simply do not see the need to involve users in the product development process; this is because it is presumed that user involvement does not necessarily shorten development times (Björk, 2009). Hence, efforts invested in such an 'inclusive' approach does not increase efficiency and, therefore, does not make business sense.

2.7.2 Inclusive Design

Inclusive design is a UK equivalent of universal design (Clarkson and Coleman, 2015). Inclusiveness in architectural design addresses accessibility issues in the built environment due to diversity in the spectrum of user needs. Inclusive design has been termed the inverse of earlier design approaches to designing for disabled and elderly people as a sub-set of the population (Story et al., 1998). Inclusive design derives its roots from the universal design principles. Inclusive design started as a movement in the US and Europe in the 1960s when the newly emerged middleclass sought to make a link between tax payment and social services, including how public services offered within the built environment could be 'accessed' (Paddison et al., 2008). Unlike mainstream design approaches, inclusive design vies not to divert attention from the majority of the population but to give greater consideration to design features that facilitate the accessibility of the built environment by every member of the society (Afacan and Erbug, 2009).

There are generally accepted guidelines for the creation of inclusive design in the built environment. According to Langton-Lockton (2004), for the built environment to be considered inclusive, it must possess at least some of the following attributes:

- As many people as possible can easily use the environment without undue effort, special treatment or separation.
- The environment is able to offer people the freedom to choose how they access and use it, allowing them to participate equally in all activities it may host.
- The environment is able to embrace diversity and difference.
- The environment is legible, predictable and of high quality.

- The environment caters for flexibility in use and provides buildings and environments that are safe, convenient, equitable and enjoyable to use by everyone, regardless of ability, age or gender.

  (Adapted from Langton-Lockton, 2004).

The premise of inclusive design is that different users may be at different levels of competence when negotiating the built environment. Hence, the level of an older worker's competence, which may be a function of age, may not necessarily manifest as a form of disability. Inclusive design thus encompasses all the segments of the society, by accommodating differences in age, gender and disability level, among others.

Research has shown that the application of the inclusive design principles result in occupant satisfaction in the built environment created (Waller et al., 2015). Furthermore, the most optimal results are achieved when expectations of end-users are adequately addressed at the design stage (Keates et al., 2000). There is a tendency for mainstream design approaches to design and create a built environment for able-bodied average users. This is an old 'sin' that can be traced back to earlier architectural designs that depict the human body as a symmetrical structure that replicates an absolute and faultless 'normalness'. Anthropological principles were later introduced to authenticate the misconceived image of human society as a uniform group, by offering dimensional references based on the 'non-existing average' user (Nowak, 1996).

2.7.3 User-centred Design

A further subset of design principles is the user-centred design. There is no one agreed definition for user-centred design, however, as the name implies, it places a great emphasis on the user and the interaction between the user and the design team, by incorporating the needs of users upfront in the design procedure in an iterative and consultative atmosphere (Gulliksen et al., 2003). The argument behind the user-centred design principle is that all products and systems cannot be expected to equally fulfil the needs of all user groups at all times, without major compromises (Kujala, 2003). This design approach appreciates the unattainable goal of design-for-all principles, and thus focuses on a particular group of users, while affording sufficient flexibility for subsequent modification in use, or users' capabilities, of the product, process or system. The user-centred design principle also facilitates the involvement of the end-users in the design procedure, and is sometimes referred to as the participative design approach (Damodaran, 1996).

2.8 Ramifications of UK Ageing Population for the National Health Service

At this stage it is important to consider the opportunities and challenges presented by an ageing population to the National Health Service (NHS). The NHS is bound to experience stretched resources as more older people are admitted to both short-term emergency units

(George et al., 2006), due to increased risk of fall (Gates et al., 2008) and related health outcomes, on the one hand, and the requirement for long-term care, due to the increasing prevalence of dementia, (Macdonald and Cooper, 2007), and other old age related morbidity, on the other hand. Facing up to these challenges, NHS nurses have a pivotal role to play. According to the Health and Social Care Information Centre (2015), nurses make up more than 28% of the 1.3 million workforce of the NHS in the UK. It is the single most widely practised profession in the healthcare sector. Beyond its size, nurses play a crucial role in the delivery of high quality healthcare services. Ensuring their ability to work is adequately supported and sustained is of vital importance for the NHS. With the challenges of an ageing population, policy interventions to recruit more nurses must be supported by nurse retention strategies that take into account the work ability of the current nursing workforce. However, it has long been established that with the overall ageing of the UK population, the nursing workforce is also ageing (Buchan, 1999). Keeping people in work longer has both long-term socioeconomic and short-term fiscal budget ramifications for most developed countries. In the UK, since the abolition of the default retirement age of 65 years in 2011 (www.gov.uk, 2015), employers are no longer allowed to make their employees redundant after they have reached a particular age. Most people can now work for as long as they want to. However, employers in certain professions may still set a compulsory retirement age, if this can be legally justified. Under the new NHS Pension Schemes, introduced on 1 April 2015, NHS employees are required to have worked until the age of 65 before they can qualify for a full state pension (NHS Business Services Authority, 2015), although reaching this age alone does not create a legal justification for retirement. Further conditions, such as minimum pension age of 55 years, and maximum age of 75 years apply to all professions within the NHS, including nursing. However, for the purpose of this study an older nurse is a practicing nurse who is 50 years or over. The following sections will introduce the nursing profession and discuss nurses' health and work environment, including the most predominant job and environmental demands of the nursing practice.

2.8.1 The Nursing Profession

The nursing profession is a stressful one (Marshall et al., 1997; Sharma et al., 2008). In a study among mental health nurses in an NHS Trust in the UK, it was shown that work-related 'burnout' is a major predictor of sick leave request and the intention to exit the profession (Sherring and Knight, 2009). A longitudinal study among Swedish nurses established that self-rated general health is one of the major contributors to both sick leave request and likelihood of leaving the nursing profession (Josephson et al., 2008). There is an increasing number of nurses exiting the profession before reaching retirement age (Frijters et al., 2007; Shields and Ward, 2001), a trend that is due to many factors, including the challenges posed by the demands of their jobs and their work environment (Verhaeghe et al., 2008; Unruh and Zhang, 2013). Furthermore, the early exit of nurses from the profession depletes the healthcare sector of much needed experience and knowledge (Duffield et al., 2014). The job and environmental demands of the nursing profession impact particularly negatively on older nurses (Heiden et al., 2013). With an ageing workforce the adaptations, adjustments and redeployments that would be needed to address the challenging job and environmental demands of the NHS workplace would require an immense amount of resources (Wray et al., 2009).

While there is an overwhelming research evidence on the correlation between stress and nurses' premature exit from the profession, these have been inconclusive. Indeed McNeely (2005) pointed out that most studies that attempt to review the nursing practice environment with regard to stress have not taken into account aggravating circumstances, such as the simultaneous exposure to work and home related sources of stress. In a predominantly female profession such as nursing, where some workers may have care responsibilities for their offspring or older members of their family, it might be premature to attribute stress to a single factor or establish a direct cause-effect relationship between stress exposure and intention to exit the profession. In fact, Walters et al. (1996) suggest that while evaluating the effect of health on work, focus on paid work would only reveal a partial picture. In addition strategies targeted at reducing nursing shortages have recognised the ineffectiveness of improving nursing remuneration alone in order to retain and recruit more nurses. Admittedly, nursing retain and recruit strategies within the NHS have gradually shifted to improving nursing working conditions (Frijters et al., 2007). Yet, the definition of what constitutes "nursing working condition" is often left undefined in literature.

Most of the debates generated around nursing working conditions have investigated psychosocial environments of the nursing practice, some of which are rather complacent, by regarding nursing work-related stress as inherent and inevitable, including the stress from coping with such emotional burden of patient illness and death (McNeely, 1995; Sprinks, 2012; Sherring and Knight, 2009; Sharma et al., 2008; Jones-Berry, 2013; Elfering et al., 2011). Invariably, most studies that have delved into the psychosocial aspects of the work environment have explored the subtle characteristics of the work environment including teamwork, job control ability, stress management, managerial support and organisational culture (Watts et al., 2013; Elfering et al., 2011; Gevers et al., 2010; McNeely, 2005). In very few instances, attempts have been made to get a better understanding of the combined effects of the psychosocial environment and the physical environment on the wellbeing of users of healthcare facilities (Andrade et al., 2012). Hence, establishing how, and to what extent, the environmental demands interplay with the older nurses in these studies may be elusive. Even when the effects of the work environment are explicitly established, questions still abound on what characteristics of the environment evoke stress in nurses. For example, Dewe (1988) argued against the "myth" that nurses working in intensive care units are more susceptible to work-related stressors than their contemporaries working elsewhere. It is, therefore, not surprising that much less research has been conducted to explore to what degree, if at all, the physical environment evokes stress in nurses within the nursing practice environment.

Nurses work in various functions, including the very physically demanding, like staff nurses on wards or in more sedentary roles, like occupational health and other specialist nurses. Also, nurses can be found in fast-paced acute care settings; in the cognitively demanding intensive care units and the emotionally exhausting oncological or palliative care units. There is sufficient literary evidence to suggest that within the nursing profession, staff nurses working in ward areas are the most exposed to the combined effects of extreme job and environmental demands (Adams and Bond, 2000). It is therefore necessary to briefly explore nursing tasks.

Dendaas (2011) purports that there are four main task domains that nurses working in acute care settings perform, upon which the physical environment exerts some degree of effects, namely: **surveillance**, **care execution, patient/family support** and **care integration**. This study postulates that environmental congruence is the extent by which the work environment facilitates a better fit between workers and their physical environment (Dendaas, 2011.). Given all other conditions (for example, job demands), it is the level of competence afforded an individual to perform these tasks that measures up to the interplay between the environmental demands and the physical, cognitive and sensory abilities. Ideally, these interactions will be in congruence provided the severity of the environmental demands does not surpass the worker’s ability.

The first task domain is surveillance. This is the degree to which patients can be seen or heard by nurses, as supported by the architectural design features of the ward area. The second task domain is care execution, which is the extent to which nurses may attend to their patients without any physical barriers or impediments. This includes, but is not limited to, the provision of personal care in bathrooms and the existence of clearance areas for the use of wheelchairs and other mobility equipment around patients. Patients and family support is the third task domain, and is the degree to which the physical environment in the hospital facilitates nurses’ ability to support patients and their family in their psychosocial needs. This task domain encompasses the availability of areas where a patient’s treatment or care plan could be discussed in privacy. The fourth task domain ward nurses perform is care integration, which consists mainly of the administrative tasks that are performed away from patients, but nonetheless, are important for patient care. This includes automated systems and technological support for nurses’ tasks in the ward area. According to Dendaas (2011), how well the physical ward environment facilitates or impedes nurses in the performance of these tasks is termed *functional congruence*. However, health has been found to be the major enabler or disabler for older nurses to perform their daily tasks and a pivotal predictor of their intention to continue working (Letvak, 2005).

2.8.2 Nurses' Health and Work Environment

The relationship between human being and the environment is very complex (World Health Organization, 1997). In order to understand the interaction between nurses' health and work environment, it is first important to define what 'health' is. According to the World Health Organization, "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (World Health Organization, 1948). While this definition appreciates the fact that the absence of disease is not sufficient to imply an individual's wellbeing, it fails to establish a broader platform to discuss health in other contexts that may be person or environment-specific. A more comprehensive definition of health as proposed by Bircher (2005, p. 335): "Health is a dynamic state of wellbeing, characterised by a physical, mental and social potential, which satisfies the demands of a life commensurate with age, culture and personal responsibility". Bircher's approach offers a more subtle foundation to discussing health and related issues in the sense that, instead of providing a platform for absolute and general criteria to determining health, it suggests non-uniform, but coherent dimensions relative to the individual context. Moreover, the explicit reference to the dynamic nature of health offers plausible grounds to infer its variability across such domains as age, culture and personal responsibility. This definition also allows for diversity that may be due to individual circumstances such as job and environmental demands. Hence, health may be viewed as a "…person's ability to achieve or exercise a cluster of basic human activities or capabilities…" (Wang et al., 2015), in as much as those capabilities are considered relative to individual contexts such as age, gender or socio-cultural circumstances.

This suggests that nurses in the same setting may react to the same environmental stimulus differently due to their individual state of health. In other words, subject to the same level of job and environmental demands, nurses may respond differently and to differing degrees. Health, therefore, has an unambiguous bearing on an individual's quality of life and standard of living (Pisarski and Barbour, 2014). Other studies have shown that older nurses may be subject to physical health injury due to ill-designed jobs and adverse environmental demands (Baptiste, 2011). However, very few studies have been conducted that illuminate the interplay between nurses' job demands and environmental demands, and what their cumulative effects are on older nurses' health. Those studies that have looked into this topic in depth do suggest strong dependency across the three variables (Soer et al., 2014). In particular, it is widely held among researchers that the job and environmental demands of older nurses have profound consequences on their physical, cognitive and sensory abilities, which are predictive of work ability (Lara et al., 2013). However, there is paucity of research study into the relationship between nurses' health and the work environment.

The quality of the nursing work environment has been attributed to its appeal to the nursing workforce, through attributes that should translate into nurse recruitment and retention (Warshawsky and Havens, 2011). There are claims that dissatisfaction with the work environment among nurses may evoke negative health outcomes (Khamisa et al., 2013). Therefore, some researchers have linked low nursing turnover rates to 'healthier' work environments (Hayes et al., 2006). For example, in the US, the recognition of the need to address nursing shortages of the 1980s led to the development of the Magnet Hospital Model. Commissioned by the American Academy of Nursing, the taskforce was charged with the responsibility of examining the characteristics of systems that facilitate or impede professional nursing practice in the US. The goal of the taskforce was coined out of the word 'magnet', that is, to identify important variables within the nursing practice and the hospital systems that create 'magnetism' which attracts and retains professional nurses. In addition, this taskforce was to report on the combination of variables that produces models of hospitals in which nurses enjoy professional and personal satisfaction (Mcclure et al., 1983). A crucial element of the taskforce findings was that what characterises 'magnet' hospitals is not limited to hospital size or geographical location, suggesting that the model might be a useful benchmark for the evaluation of nursing practice environment elsewhere. A work environment is considered 'magnetic' when attributes that staff nurses considered to be important are also present in the nursing practice environment (Kramer and Schmalenberg, 2004). One of the most important aspects of the nursing work in this study is what respondents termed 'professional practice', which consists of the 'mode of practice' and 'work environment'. Mode of practice, as described by participants, constitutes autonomy, professional practice models and availability of resources, which contribute to higher quality of care and job satisfaction. This finding is consistent with Finn's (2001) claim that professional autonomy is one of the most important factors that contributes to nurses' job satisfaction.

An interesting conclusion of the magnet study was that the 'work environment' and the latitude over it was highlighted as a key characteristic of a magnet hospital. Yet, the term 'work environment' had not been explicitly defined, which makes it difficult to make informed comparison across settings. This study, however, provides one of the earliest record of an evaluation of nursing practice environment, although it fell short of producing the evidence base for a holistic approach to establishing correlations between nurses' health and work environment.

Subsequent studies that reviewed the magnet hospital models have failed to follow up on the significance of the work environment to contribute to nursing recruit and retain strategies, let alone draw a parallel between it and the health of nurses (Kramer and Schmalenberg, 2004). In a study by Buchan (1994), which compared the magnet hospitals of the US to the UK nursing practice environment, there was a complete omission of the 'work environment'. Decades after its first introduction, a number of attempts have been made to provide ‘objective’ measure of some of the characteristics of the magnet hospital model, in order to establish associations between nursing practice environment and nursing outcomes, notably the Revised Nursing Work Index (NWI-R) by Aiken and Patrician (2000) and the Practice Environment Scale of the Nursing Work Index (PES NWI) developed by Lake (2007). These instruments, however, are rather lacklustre in their adequacy to establish unequivocal relationships between nurses’ health and the work environment. Neither of the two instruments consists of features that have been set to determine explicitly the interplay between nurses and the work environment. Budge et al. (2003), against this backdrop, conducted a study in New Zealand, which found that autonomy and the ability of nurses to control their work environment have been attributed to correlate with nursing staff health status. All of these studies have only offered confounding associations between nurses’ health and work environment, so there is hardly a bona fide literary reference base for the evaluation of nurses’ health status relative to their work environment.

In addition, the role age plays in these relationships has not been effectively elucidated in these studies. A compelling question to pose at this point is the plausibility of an interplay between nurses’ age and health. In associations non-related to the work environment age has been found to bear some correlations. For example, a study conducted among Australian nurses found that age is a significant predictor of physical health of nurses (Chang et al., 2006). McGarry (2004) observed that even after accounting for the effects of objective health, such as disease conditions, subjective health still remains the main driver of older nurses’ decision on earlier retirement. If a person’s state of health and wellbeing must be considered multidimensional and as being relative to objective attributes, such as age, a worker’s ability to perform certain tasks at work must thus be seen as concomitant with health and wellbeing.

2.8.3 Nursing Job Demands

Job demands are the visible and latent aspects of a job that require a degree of physical, cognitive and sensory abilities, and/or organisational resources to manage (Bakker et al., 2004). The demands of a job may manifest as time pressure, workload, or conflicting requirements (Demerouti and Bakker, 2011). Nurses face various types of on-the-job demands, stemming mainly from the relationships or transactions between their physical, cognitive and sensory abilities, and the characteristics of the work environment (job and/or environmental demands of the workplace).

Job demands are not necessarily negative in nature or in their outcomes. Some research studies show that certain types of job demands are particularly motivating with positive outcomes and better employee performance (Van den Broeck et al., 2010). However, persistent exposure to excessive or increased job demands is known to be detrimental to employee health and job performance (Meijman et al., 1998). In contrast, earlier research into the relationship between job demands, job control and job strain, has shown that it is not high job demands in itself that constitute job strains in employees, but it is the lack of adequate control or resources to manage the job demands that causes job strains (Van Yperen and Hagedoorn, 2003). This idea is supported by Karasek (1979), who suggests that there are two important elements of the work environment that are necessary for job strain to come to play, i.e. the job demands placed on the individual and the discretion allowed the worker on how to meet these demands. The ability of the employee to mediate challenging job demands has been linked to loyalty and intrinsic job motivation (Jourdain and Chênevert, 2010). As a result, a job high in demands but that is, nevertheless, afforded a proportionate amount of decision latitude or control could lead to a worker's increased sense of competence and productivity (Dollard et al., 2000). However, this approach has been criticised due to its simplistic explanations of the many aspects of a job in the complexity of a work environment (Bakker et al., 2010).

In the job demand-resource (JD-R) model, Bakker and Demerouti (2007) postulate that "…job demands are initiators of a health impairment process, while job resource are initiators of a motivational process." According to the JD-R model, every occupation has its own inherent risk factors that are predictors of job-related stress. The physical, psychological and emotional aspects of the job that require sustained effort are categorised as the *job demands* (Hall et al., 2013), while the *job resources* are the energy reservoirs that an employee may resort to when faced with overwhelming demands (Hobfoll, 2002, Hobfoll, 1989). Job resources are mediating factors to the negative effects of job demands like stress (De Jonge and Dormann, 2006). Hence job resources should be proportionate in their quantity (Bakker et al., 2005) and quality (Lavoie-Tremblay et al., 2014) of physical, psychological, social or organisational dimensions in order to fulfil these functions in the workplace. High job demands, as attributable to the nursing profession, may therefore impact negatively on health and wellbeing; the activation of functional and corresponding types of job resources, on the other hand, may mitigate the effects of these job demands (Van Den Tooren and De Jonge, 2008).

2.8.4 Nursing Environmental Demands

Environmental demands consist of the physical aspects of the work environment, including, accessibility and layout, ambient lighting, indoor air quality and ventilation, thermal comfort, acoustics, signage, visual effects and colour coordination (Djukic et al., 2010). When evaluating environmental demands in healthcare settings, two strands of research endeavours are easily evident. The first one is that most studies have focused on the impacts the physical environments have on patient healing process (Huisman et al., 2012). An increasing number of researchers have reported the importance of the physical environment on patient health (Devlin and Arneill, 2003). Indeed, a number of studies have documented the positive impacts of the built environment on the healing and care of patients (Abbas and Ghazali, 2012; Gross et al., 1998). Despite these established research evidence of the relationship between patient health and the physical environment, only a few studies have investigated the relationship between the physical environment and nursing outcomes. The second one is (the focus of this study) an emerging trail of research evidence that can be discerned when the nursing workforce is the subject of study, in which emphasis has been laid on a limited aspects of the physical environment. These will be discussed in the following paragraphs.

First, one of the greatest environmental demands older nurses face in the workplace are insufficient and functionally inadequate spatial workspace for moving and handling task performance, such as patient-bathing (Hignett and Evans, 2006). A study that explored how nurses' perception of their work environment influence patient moving and handling revealed that nurses perceive bathroom transfer as the most difficult type of moving and handling, with three out of four significant transfers associated with this location (Holman et al., 2010). In addition, the benefits of single-occupancy patient rooms for patients have been extensively reported, notable in the reduction of the risk of infection (Chaudhury et al., 2006); better auditory and visual privacy for patients (Barlas et al., 2001); and improved communication between doctors and patients (van de Glind et al., 2008). Other studies have documented that single occupancy patient rooms increases overall staff satisfaction and reduces staff stress (Shepley et al., 2008). Yet, when other nursing outcomes are taken into consideration, the evidence base seem to be rather inconclusive. For example, nurses working in single occupancy units have reported isolation (Stichler, 2012) and diminished patient visibility (Walsh et al., 2006). It appears that architectural design features aimed at satisfying patients might not necessarily translate into positive outcomes for nurses. When age is taken into account it has been found that older nurses become more susceptible to the physical demands of the health care environment as they age (Fitzgerald, 2007).

A plethora of studies have focused on the benefits of natural lighting on patient healing process (Schweitzer et al., 2004, Walch et al., 2005). Yet, nurses have often expressed dissatisfaction with the lighting provision in their workplace (Dianat et al., 2013). Poor lighting has been found to affect nursing task performance in general (Chaudhury et al., 2009). In particular, increased access to natural lighting is said to evoke positive health outcomes for healthcare workers, while poor ambient lighting has been linked to a spike in medication errors (Nelson, 2006). Given that the ward work environment may be dimmed to suit the needs of patients, there might be competing architectural design features within the same unit, therefore localised, or task-orientated ambient light might be critical for nurses to function at work. When age dimension is considered, difficulty in reading medication labels has been found to be exacerbated by poor lighting for older nurses (Fragar and Depczynski, 2011).

A myriad of research has shown that hospital acquired infection is a critical problem usually associated with adverse patient outcomes (Kelly and Monson, 2012, McFee, 2009), some of which may be airborne, due to poor indoor air quality and/or ventilation. These pose a risk of infection to both patients and workers (Bartley et al., 2010). There is also a growing body of literary evidence that healthcare workers are affected by poor indoor air quality and suboptimal ventilation (Beggs et al., 2008). Healthcare workers, especially those working in large compact environments, such as wards, are equally exposed to a higher risk of airborne infection (Qian et al., 2010). However, it has been reported that improved indoor air quality could be directly linked to adequate natural ventilation (Escombe et al., 2007). Therefore, the role of natural ventilation in the prevention of airborne infection raises the question of how to reconcile patient needs with the expectations of healthcare staff (Gilkeson et al., 2013).

Thermal discomfort has been found to lead to the development of musculoskeletal disorders (MSDs) among hospital workers, including nurses (Magnavita et al., 2011). While there is no clear evidence of a cause-effect relationship between emergency hospital admissions and high ambient temperatures (Kovats et al., 2004), uncharacteristically high temperatures, as experienced during heat waves, are said to adversely impact on older people's health, and can increase the risks of cardiovascular deaths among individuals aged 45 years and older (Joacim et al., 2010). Mortality rates among patients 65 years and older are said to be the highest compared to other age cohorts in a hospital ward environment in an event of uncontrolled heat waves (Basu and Samet, 2002). Consequently the resilience of hospital building fabrics to external temperature, undoubtedly impact the ambient internal ward temperature and, if not adequately regulated, could be harmful to both patients and healthcare workers (Iddon et al., 2015).

The tranquillity of the ambient environment has a positive effect on patient healing (Abbas and Ghazali, 2011; Gross et al., 1998; Huisman et al., 2012). Yet wards are known to be one of the noisier parts of the hospital due to the temporal interactions between patients, the healthcare staff and the patients' families. Even when so much has been done to mute the noise in a healthcare facility, patients may still find some forms of noise intruding. Hushed voices, whispers, the rasping of the bed curtains and the squeaking of the hospital trolleys are some of the pervasive noise nuisances patients may have to endure (Rice, 2003). It is plausible that these impact on healthcare workers equally. Indeed, research has shown that, ahead of visual aesthetics and olfactory effects, the acoustic characteristics of a healthcare facility is the third most important design feature for healthcare workers (Mackrill et al., 2013). The ability of a nurse to perform the tasks described by Dendaas (2011) in the surveillance domain described earlier may be impeded far more by noise than by visual obscurity. This is because the lighting in a ward environment may be dull, hence nurses might tend to rely more on their auditory capability rather than their sight acuity (Spencer and Pennington, 2014).

Based on the above, it does seem that when the physical aspects of the work environment had been the focus of study, the resultant impact this has on nurses and other healthcare workers had been rather coincidental (Huisman et al., 2012). The existing body of literature seems to suggest a mixed perception of the correlational relationship between the architectural design features of hospital facilities and nurses' satisfaction with their physical work environment.

2.8.5 Nursing Personal Constructs

In addition, understanding the personal constructs that is generally affected by these work stressors is equally useful in order to identify the characteristics of the challenging job and environmental demands for older nurses. The personal constructs of older nurses affected by the work environment are those aspects of personal health and wellbeing that serve as resources for nurses, so that that they can be functionally fit to perform their jobs (Wang et al., 2015). Personal constructs may be in the form of physical, cognitive, sensory, emotional and social health attributes required of a nurse to perform their tasks. For example, some studies suggest that deteriorating physical ability and/or declining cognitive acuity together are predictors of nurses' sickness absences (Roelen et al., 2014). From a social personal construct perspective, extremely acute job demands have been found to have a negative impact on teamwork, which is a key part of the nursing profession (Nelsey and Brownie, 2012). Furthermore, collegial relationships are also negatively affected if team members' are depleted of their energy resources (Gevers et al., 2010), which could in turn lead to reduced resilience of nurses to job and environmental demands (Cope et al., 2014). This supposition partly explains why nurses rate the ability to act independent of other colleagues as a positive element of their job (Unruh and Zhang, 2013), and so disregarding the inherent collaborative nature of the nursing profession (Quoidbach and Hansenne, 2009).

Competing job demands may subject nurses to professional compassion fatigue or 'burnout' (Morrison and Korol, 2014) and exhaustion (Zito et al., 2015). Compassion fatigue and exhaustion impair nurses' physical and cognitive functioning, and thus endangering both nurses' and patients' safety (Han et al., 2014, Kirwan et al., 2013). Nurses' compassion fatigue may manifest in various forms of personal constructs including physical, cognitive, social, emotional and sensory (Coetzee and Klopper, 2010).

Furthermore, environmental demands of the job may support or impair nurses' health, wellbeing and productivity at work (Van Bogaert et al., 2013). Questions have been raised about the adequacy of the physical work environment for healthcare workers (Mourshed and Zhao, 2012) and patient safety (Kirwan et al., 2013). The physical layout of medical wards and, especially spatial constraints are said to adversely affect medication communication processes among medical staff (Liu et al., 2014). In addition, nurses' negative perception of their work environment, is a predictor of their intent to stay or leave the profession (Lamontagne et al., 2004).

Hence, while the term ***older people,*** as defined by the Office for National Statistics (2011), may refer to people at that stage of adulthood when the person is gradually disengaged from the socio-physical environment, an ***older worker*** is a person that may have become dependent, in varying degrees, on the adaptability of the work environment in order to continue to maintain their work ability. Hence, while this study appreciates the prevalence of person-specific health conditions that may or may not inhibit an older worker in the work environment, the overall hypothetical approach is that such workers will still be in good health. Taken together, the perspective that is adopted in this research is that a person in active employment and aged 50 years and above is an ***older worker*** (Department for Work and Pensions, 2013). As this is presumably the 'last' decade prior to retirement for most people and jobs types, with or without regard to the SPA, the accommodating features of the workplace is most critical for workers in this age cohort.

2.9 The Conceptual Framework

To progress with the study objectives, it is essential to design a roadmap to help the field investigations of this research study. This roadmap will be the conceptual framework of the research project. The conceptual framework is intended to build on existing body of knowledge to construct further knowledge about the field of enquiry. The conceptual framework is guided by the overarching aim of the PhD study, i.e. to develop a framework for the assessment of nursing tasks and environmental demands. Before venturing into developing a conceptual framework, it is useful for the researcher to first understand the existing body of knowledge in the field of investigation, by undertaking a literature review. This stage has already been accomplished in the earlier sections of this chapter. The next task is to determine what is known at this stage according to the literature review and how that knowledge could inform the development of the conceptual framework. According to Seuring and Müller (2008, p. 1700.) a literature review helps to "…summarise existing research by identifying patterns, themes and issues, and to identify the conceptual content of the field and can contribute to theory development". In accordance with the six objectives of the project presented in Chapter 1, the results of the literature review have provided sufficient evidence to formulate the conceptual framework. The question is how the conceptual framework supports the accomplishment of these six objectives, which would in turn inform the ultimate aim of the research project, i.e. developing the Nursing Tasks and Environmental Assessment Framework.

To formulate the conceptual framework, guidance can be sought in the graphic illustration developed by Bircher (2005) in Figure 2.6, which depicts the relationship between the total potential someone can achieve and the demands that person may be subjected to, depending on the assumption that the individual is healthy or diseased. Hence, whereas the total potential of the person on the left is higher than the one in the middle, the demand placed on both of them by their environment is the same. The summation of 'health' and 'disease' thus account for the difference in their potential. Conversely, while the individual on the right hand side has the same potential as the one in the middle, he enjoys a relatively good health, because the demands by the environment have been reduced more than the potential. Since competence diminishes with age (Oswald et al., 2007), this idea is supported by Lawton's environmental docility hypothesis in that it recognises dependency of an older person on environmental circumstances and therefore, suggests reducing such barriers in order to enable older people's activity of daily living.

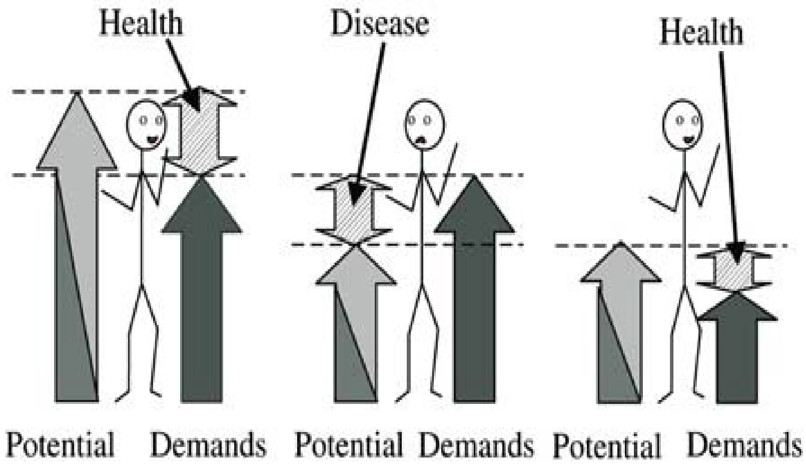


FIGURE 2.6: Towards a Dynamic Definition of Health and Disease

(Adapted from Bircher, 2005)

Based on the above, it can be argued that by manipulating the design features of the workplace, the competence of older nurses can be enhanced in a hospital work environment. This presupposition, however, requires the objective assessment of the job demands older nurses are experiencing, the environment demands placed on them in the hospital work environment, and the nursing functional capacity, which is dependent on the extent to which the work environment is an 'enabler' or a 'disabler' in this context.

The conceptual framework for this research study consists of three components (Figure 2.7), namely, job demands, functional capacity and environmental demands of ward nurses in the hospital work environment. It is presumed that the harmonisation of the three components would create a fit between older nurses and their workplace and thereby support an age-friendly work environment within the NHS.

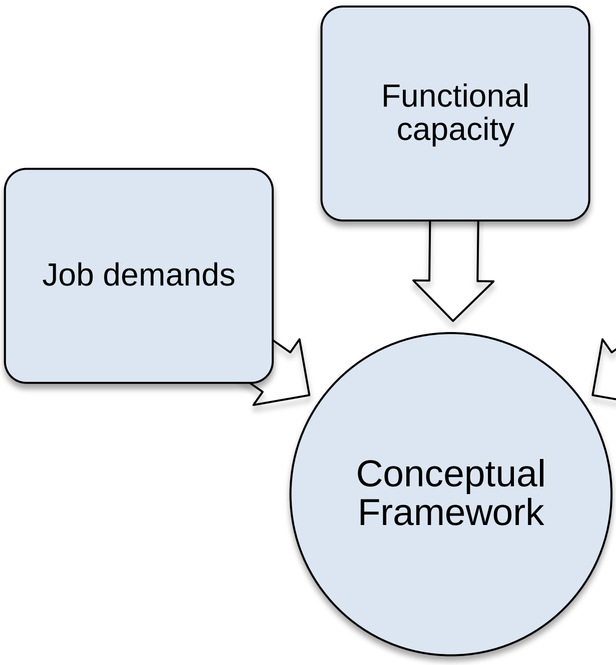


FIGURE 2.7: Research Conceptual Framework

The conceptual framework is not the research design; however it guides the way the research is designed, how the field investigation is conducted and how further literature is sourced. It serves as the lens through which data is themed and analysed. In Chapter 8, detailed explanation of how each of the components of the conceptual framework has supported the development of the NTEA Framework is given.

2.10 Research Gap and Originality

At this stage it is worthwhile to recapitulate the main findings of this research study thus far, based on the literature review. In section 2.3, the historical background of the UK population was presented, while section 2.4 illuminates the future trends. In sections 2.5, the gerontological contexts of ageing were discussed. Section 2.6 explored the theoretical underpinnings of the research study, and it was established that the P-E fit theory can provide a theoretical foundation. In section 2.7 it was shown how holistic design principles, such as universal and inclusive design, can be employed to create a fit between an older worker and their work environment.

Furthermore, in section 2.8, the potential impacts of the ageing population on the UK healthcare sector was explored and the justification of choosing NHS as a source of data collection was demonstrated. The personnel figures and the vast amount of work areas involved position the NHS as an ideal case study for this research because it is presumed that, compared to other workplaces and employers, the changing trends in the age profile of the NHS workforce could potentially have the greatest impact in the UK. Over the years, nursing practice has grown to be a profession in its own right within the healthcare system in the UK and has attained its current status as an indispensable part of the UK healthcare system because the activities undertaken by nursing practitioners are informed by 'research-based body of knowledge'. Section 2.8 presented the conceptual framework of the research study, while section 2.10 identified the research gap and originality. The overarching aim of the PhD research project is to support an age-friendly work environment within the NHS. Against this background, the main findings gathered from the literature review so far suggest that:

a) Clearly, the UK population is ageing and there seem to be some evidence that its workforce is equally ageing, as more older workers are participating in the labour market (Office for National Statistics, 2014);
b) There is a strong dependency by older people on their physical and socio-cultural environments (Satariano, 1997, Shumway-Cook et al., 2003);
c) An individual's competence to overcome environmental demands may deteriorate alongside advances in age; however, this decline in competence can be compensated for by experience and familiarity with their physical and socio-cultural environments (Clarke and Nieuwenhuijsen, 2009);
d) Older workers engaged in physically demanding jobs tend to retire earlier compared to workers in sedentary job role (Landau et al., 2008);
e) The job demands, environmental demands, and the personal constructs of nurses on which these demands impact were identified, namely physical, cognitive, sensory, emotional and social;
f) Lawton's Ecological Model provides a theoretical basis for this study; however, this model must be adapted and put in the context of older nurses; and, finally,
g) By adapting the P-E fit theory, the activities of daily living, as used for older people in the home environment, could be replaced by 'nursing functional capacity' in the context 'nursing tasks' in the given work environment setting in NHS in order to create a better fit between NHS nurses and their work environment.

Based on this literature review so far, it can be postulated that this study has identified a research gap in adapting an existing theory and applying it in a new setting. The use of the P-E fit theory in the work environment for older nurses is expected to make original contribution to knowledge.

2.11 Summary of Chapter 2

This chapter has presented the detailed literature review conducted in order to establish the knowledge already existing in the multidisciplinary fields of this research study and how this may inform both the literary and empirical investigation. The chapter started by outlining the literature review strategy, then by discussing the eighteenth century Malthusian theory of population in relation to the industrial revolution that gave rise to exponential increase in productivity of both cultivated farmland and industrial output. The chapter then explored the demography trends in the UK in the period immediately followed by the second World Ward, during which time a surge in the population was experienced. The challenges posed by the impending retirement of the baby boomer were highlighted. Chapter 2 continued by exploring the gerontological contexts of ageing, by discussing three frequently cited treatise of ageing in gerontological terms, such as successful ageing, the life course phenomenon, and environmental gerontology. The chapter then established the theoretical underpinning of this study to be the P-E fit theory. It was argued that P-E fit theory could be adapted from the environmental gerontology discipline and used to illuminate the interplay between ward nurses and the ward work environment, through the thoughtful design of the built environment. The chapter further explored evidence-based design principles that can be used to create a fit between the built environment and its users. The universal design, inclusive design and user-centered design principles were briefly discussed. At this point the literature review established the ramifications of an ageing population on the healthcare system in the UK, as an increasing number of older people will place higher demands on the NHS resources. It was therefore postulated that as the most widely practised profession within the NHS, the impacts of the ageing NHS workforce will be more profound for nurses. Chapter 2 thus presented the conceptual framework of the research study, which has been constructed mainly through the literature review at this stage. The chapter demonstrated what research gap had been identified and how this study could potentially make original contribution to knowledge. Chapter 2 concluded by showing the rationale to develop the Nursing Tasks and Environmental Assessment Framework, a means to the end; to creating an age-friendly work environment within the NHS.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methodological approaches and considerations employed throughout this PhD study. This study is a social science research and cuts across disciplines, such as architecture, environmental gerontology, psychology and sociology. Based on the research objectives presented in Chapter 1, it was decided that a qualitative research methodology should be applied as this will help to establish a deep understanding of the subject, while ensuring the nuances of the topic are captured. This chapter starts by discussing the philosophical assumptions of research in general, before positioning this study in the sphere of interpretivist paradigm. The considerations for choosing the research methodology are provided. The chapter then introduces the five main research approaches frequently used in qualitative research, after which the rationale behind a case study as a means of data collection is demonstrated. The challenges to embed reliability and validity in qualitative research are presented, including how these have been resolved in this PhD study. Then the four stages of the research process, including data collection, data analysis, data synthesis and result construction, were detailed. The chapter concludes by giving a brief reflective account of the research methodology.

3.2 Philosophical Assumptions

Before venturing into asserting philosophical assumptions, it is useful to first establish what constitutes research, to define the word ‘research’ in abstract, detached from every day use. The Oxford English Dictionary defines the word ‘research’ as: ”…the act of searching carefully for or pursuing a specified thing or person…” (OED, 2016). The same dictionary provides an alternative definition that splits the word ‘research’ into two syllables, by giving literary definitions to both ‘re’ and ‘search’ and combining the two meanings: “…the act of searching again, …a second or subsequent search…”. The first definition suggests that ‘research’ is a *deliberate* and *thoughtful* process, meaning that the series of actions taken to arrive at the objective of the research were not coincidental and inadvertent. The second definition, on the other hand, has a tacit replicability of the research actions to its meaning, suggesting that such actions could be repeated, and the same or similar results would be achieved. The two definitions, however, should be read as complementary and not mutually exclusive; i.e. the deliberate actions undertaken during the research process might have been recorded for future references, which enables the replicability of the process, by ensuring that the same (intended) results are achieved consistently.

Hoyle et al. (2002) define research as a ’way of knowing’. According to Hoyle and colleagues, what distinguishes social science research from casual observation is the ability of the researcher to replicate the process of 'knowing'. Davies (2007) takes a methodical approach to defining research, by presenting the research procedure as process-driven. Research must be conceived as a process of "…gathering data in a strictly organised manner…through structured investigation, exploration and the intent to make new discovery" (Davies, 2007, p. 17). Moore (2006), on the other hand, confines the conduct of research into academic realms, by defining research based on the way it is used either to advance 'theoretical' understanding of the world around us, or to solve a problem and develop a 'practical' understanding of a situation. A more scientific definition is the one given by Walliman (2011), who defines research by relating it to two spheres of human learning (experience and reasoning). While experience 'happens' in an uncontrolled and haphazard manner, reasoning is a method of coming to conclusion through logical argument. On this premise, Walliman defines research as a combination of both experience and reasoning, a self-correcting process that involves "…rigorously testing the results obtained, and methods and results are open to public scrutiny and criticism" (Walliman, 2011, p. 6). Along the axis of Moore (2006) and Walliman (2011), Imenda (2014) opines that research is a "…systematic, controlled, empirical, and critical investigation, of natural and social phenomena, guided by theory and hypothesis about the presumed relations among such phenomena...", and in which "…subjective beliefs are checked against objective reality" (Imenda 2014, p. 186). Sechrest and Sidani (1995) offer philosophical definition of research, by asserting that scientific investigation is about theory and theory is about understanding, and understanding is about predictability. Since predictability reduces uncertainty, the intent of 'scientific inquiry' (i.e. research) is thus about reducing uncertainty about the social world. This 'philosophical definition', is particularly important in social science research, where understanding and predicting human behaviour is of a high order. As noted by Kelly (1955), the way we know whether we understand a person or a phenomenon is in our ability to predict with accuracy what that person is going to do or what will happen. Research is thus a systematic means of knowledge construction, a process, which can be validated through empirical means in the real world.

Philosophy is an abstract of ideas and beliefs that inform research. According to Sarter (1988) philosophy is a rational or an intuitive pursuit of the nature of reality. Philosophical assumptions in research projects provide scholarship to the study by positioning it within the research community (Creswell, 2007). Philosophical assumptions are important because they shape how we formulate the research problem or how we design the research and seek to go about finding answers to the research questions, in order to generate knowledge. Since the existence of knowledge itself cannot be separated from the owner or acquirer of knowledge, the philosophical underpinnings of knowledge generation must be married with the intent of research. This is what Somekh and Lewin (2011) describe as the 'philosophy of science': "…that which is concerned with the underlying logic of the scientific method" (p. 202). The subject of study, the process of knowledge acquisition and the person acquiring the knowledge share certain philosophical characteristics. Regardless of the researcher acknowledging and appreciating that their own worldviews are embedded in the process of knowledge generation, this is almost inevitable. Philosophical assumptions thus raise the question of what is already ‘known’ about the subject matter. Table 3.1 outlines five philosophical assumptions made in the process of qualitative research design (Creswell, 2007). Whether deliberate or subconscious, these philosophical assumptions interweave with, and define, the research design process. What brings scholarship to social science research in the knowledge generation process is the deliberate application of these philosophical assumptions in the design of the research project. As concluded by Munhall (1989), the ultimate goal of philosophy is the attainment of wisdom.

TABLE 3.1: Philosophical Assumptions with Implications for Practice

Assumptions	*Questions*	*Characteristics*	*Implications for Practice (Examples)*
Ontological	What is the nature of reality?	Reality is multiple as seen through many views	Researcher reports different perspectives as themes develop in the findings
Epistemological	What counts as knowledge? How are knowledge claims justified? What is the relationship between the researcher and that being researched?	Subjective evidence from participants; researcher attempts to lessen distance between himself or herself and that being researched	Researcher relies on quotes as evidence from the participant; collaborates, spends time in field with participants, and becomes an “insider”
Axiological	What is the role of values?	Researcher acknowledges that research is value-laden and that biases are present	Researcher openly discusses values that shape the narrative and includes his or her own interpretation in conjunction with the interpretations of participants
Methodological	What is the process of research?	Researcher uses inductive logic, studies the topic within its context, and uses an emerging design	Researcher works with particulars (details) before generalizations, describes in details the context of the study, and continually, revises questions from experiences in the field
Rhetorical	What is the language of research?		

Source: Creswell, 2007

Philosophical assumptions revolve around five axes that converge to form the research ethos, which guides the researcher in formulating the research strategy and navigating the field of investigation. This is an iterative process that starts with ontological presumption of the pre-existence of knowledge or some form of knowledge; then through to the epistemological relationship between the researcher and the researched phenomenon. Further, the axiological role of the researcher's values and beliefs and how this might have contributed to the construction of the research strategy is conceptualised. The process concludes with the development and deployment of appropriate methodology and how the rhetorical interpretation of what knowledge has been discovered underpin the philosophical assumptions of the research (Figure 3.1).

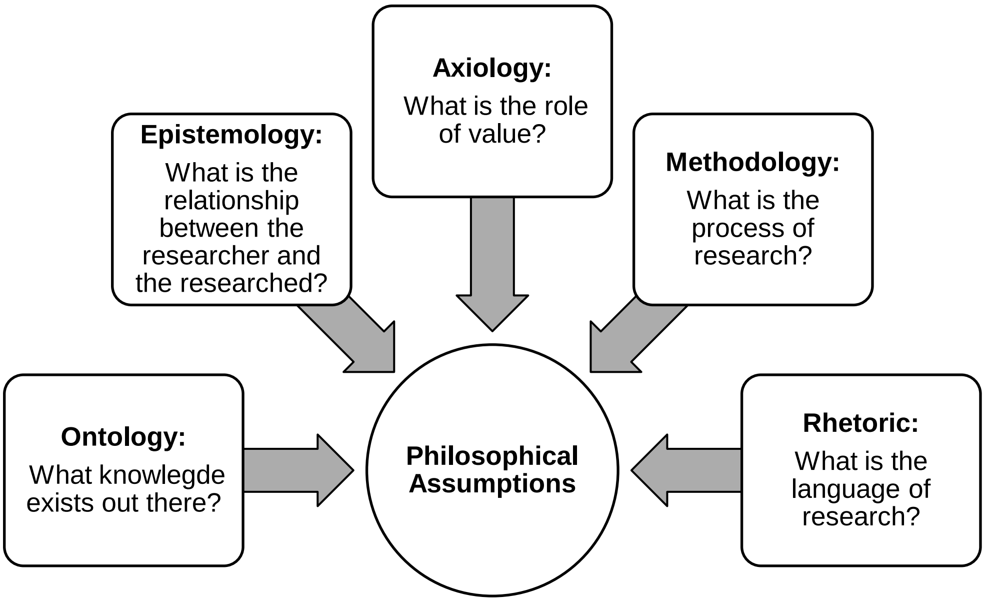


FIGURE 3.1: Research Philosophical Assumptions

3.2.1 Ontology

The ontological assumption posits the essence and substance by which knowledge exists or occurs in its natural form (Gruber, 1993). There is a need for a paradigm shift from a state of cognition that precedes the realisation of the existence of knowledge. The ontological assumption presents a hypothetical question of if knowledge existed in the first instance and what is (or was) the nature or form of its existence: 'What knowledge already exists out there?' Modern societies are particularly attentive to identifying, observing, recognising and registering the occurrence of an impetus or moment by which knowledge comes to being (Leach and Davis, 2012). An ontological assumption also deals with the paradox of the simultaneous or parallel occurrence of knowledge and the existence of multiple or parallel realities (Sale et al., 2002). This ontological assumptions of the multiple existence of knowledge stems from knowledge being characterised as existing only relative to the owner or possessor of knowledge. In the field, the social science researcher will be confronted with a multitude of participants; and he or she should be ready to accept this existence of multiple realities on the same issue or subject matter: i.e. the truth, relative to its source. At the onset of the research design process, the researcher should be aware that their own and other people's ontological assumption of the knowledge on the topic of study may be very different. Hence research attention is focussed on what knowledge already exists in its various forms. One of the ontological assumptions made in this research study, for example, is that design of hospital wards may be used to enhance nurses' work ability. This 'assumption' is derived from what is 'known' about the dependency of older people on the built environment, according to Lawton (1974), who suggest that reducing physical barriers in the built environment enables older people. While evidence from literature suggest that similar association has not been established in the context of older workers and work environment, there is literary evidence that the design of the built environment may be used to 'enable' users and facilitate the accessibility to older people's housing, as shown by Iwarsson (1999). This ontological assumption provides a basis to make original contribution to knowledge in this study, as an exisitng theory is being used in a new context. This is one of the ontological assumptions made in this study prior to the gathering of empirical evidence.

3.2.2 Epistemology

Epistemological assumptions situate the researcher and the source of knowledge (participants) in a virtual field of relationship (Hofer and Pintrich, 2004). Research in natural sciences may portray the researcher as the knower or possessor of knowledge, the social science researcher, appreciating their own beliefs and biases arrives at the field of study with the intention to get as close as possible to the source of knowledge, i.e. the participants (Flyvbjerg, 2006). Caution needs to be applied against the falsehood of the presupposition that a social sciences researcher is an objective outsider, a passive instrument of data collection; an instrument that is intended for capturing and unmasking pre-existing 'truth'. Creswell (2007) argues that the social sciences researcher arrives at the field of study with the intention of reducing the distance between him or herself and the source of knowledge (i.e. the participants), by getting immersed into the social systems (organisations, communities, institutions, etc.), which is the medium that conveys knowledge from the participant to the researcher. It is therefore understandable why May (2002) refers to a qualitative researcher as being "implicated in the construction of the known", and offering an interpretation to "…the dynamics of the contents of society and social relations" (p. 2). The epistemological stance taken by this research study is that participants' views about the topic will be disparate. For instance, empirical data collection began by first interviewing mainly NHS managers, to gain an overview of what constitutes an age-friendly work environment from participants' perspective. While one may rightly expect managers' views on the research questions to be different from those of other people lower in organisational hierarchy, by collecting data from multiple sources, subjectivity and participant biases could be reduced.

3.2.3 Axiology

No matter how well embedded the qualitative researcher eventually becomes in the process of knowledge construction, the positivist presupposition is that the researcher is reporting back on knowledge, that was waiting to be discovered (Astley, 1985), a process in which there would be no place for biases and subjectivity. While such positivist positions may hold in natural sciences, social science research embraces and accommodates pre-existing beliefs and values brought into the knowledge construction process by the researcher. The challenge for the qualitative researcher is to be aware of the existence of such values and also appreciating that the knowledge being constructed is not at all bias-free. The axiological assumption positions the researcher in context within the field of study, admitting that the researcher's interpretation of the knowledge being constructed is heavily shaped by the beliefs and biases that the researcher brought into the study. An important axiology made in this study is that some crossroad decisions have, inevitably, been influenced by the researcher's own background and values. For example, while some of the ontological assumptions made in this study are derived from environmental gerontology discipline, this research itself is situated within the built environment. This is notable in the application of the P-E fit theory, supported by the empirical use of post-occupancy evaluation as corroborative evidence. Understandably, information gleaned from participants is value-laden; however, the interpretation of such information would be shaped by both the theoretical underpinning of P-E fit and the practical application of POE.

3.2.4 Methodology

An implicit or explicit paradigm shift is necessary for knowledge to be constructed (Berger and Luckmann, 1991). This process assumes that the researcher probes for knowledge through a medium of inquiry, i.e. the data collection tool. The plane of communication between the researcher and the respondents is inseparable from the knowledge construction process (Begley, 1996). This includes not just overall research design or strategy, but also the tools and instruments of data collection. The power relationship between the researcher and respondent; the mode and atmosphere of data collection; the continuous evaluation and revaluation of the data that is being collected to inform, define or redefine the subsequent data collection activities, are all subject to the methodological assumptions made by the researcher. The process must afford the researcher an adequate power and latitude to be able to delve into the data in the field in sufficient details, before any inductive inference can be drawn (Karnieli-Miller et al., 2009). The methodological assumptions employed in this study is not just to collect data from multiple sources, to reduce bias, but to design the mode of data collection such that it is fit for purpose. The choice of interviews, focus groups, post-occupancy evaluation have been made because these methods of data collection were 'assumed' to be the most appropriate. For instance, in the exploratory stage of the study, while interviews were used to understand managers' views of the NHS workplace, focus group was used to collect data about the nurses' perception of job and environmental demands. Furthermore, the ‘assumption’ that semi-structured investigative interviews will help to understand nursing tasks better, rather than participant observation has its inherent risks and biases in the methodological approach in this study. One advantage of participant observation is that the researcher can ‘observe’ the social phenomenon directly, thereby reducing respondents biases. However, this also poses the risk of misinterpretation, as the researcher may not be able to ‘objectively’ discern the type of tasks a nurse working at desktop computer is performing, whereas this can be easily clarified in an interview. Likewise, participants’ responses may be overtly influenced by their individual experience and circumstances. A participant with a health condition, which negatively affects their work ability, may overstate the severity of job and environmental demands. Whichever method used to collect data, there is bound to be some elements of bias, therefore the researcher must make underlying assumptions when making methodological decisions.

3.2.5 Rhetoric

While these ontological, epistemological and axiological assumptions posit the researcher in the field of investigation, equipped with theoretical and practical tools to explore and discern the world around him or her, the ultimate findings of the study, the “essence” of what has been “learnt” need to be communicated to the research community or the intended audience; in a simplistic form, the literary presentation of scientific knowledge (Gusfield, 1976). The audience for which the research report is intended has its own language: its rhetoric. In social science research rhetoric can be a very powerful tool to communicate research results, and as such, cannot be dissociated from the setting of the philosophical assumptions within which the research is situated. For example, Firestone (1986) suggests that when scientific writing overtly distances itself from emotive expressions (rhetoric), the resultant ‘objectivity’ serve as a form of latent persuasion. A researcher in the social science studies, who had been immersed in the studied social phenomenon, and who, as conventionally required, presents the findings of the research study ‘bias-free and objective’ may actually call for caution, as stripping the findings of the research study of researcher values, detracts from the credibility of the study. This thesis presents the results of a qualitative social science research. Different types of data has been collected from various sources and at different stages. These have been analysed and triangulated. However, what is being presented in this thesis is more of the researcher’s interpretation of ‘truth’, rather than a ‘value-free’ condensation of it.

3.3 Research Paradigms

There are a number of research paradigms or worldviews underpinning any social science research study. The most commonly referred to in literature, are the positivist paradigm and the interpretivist paradigm (Table 3.1). These two paradigms are discussed in the next sections.

3.3.1 Positivist Paradigm

The positivist holds an ontological worldview that knowledge is ‘out there’ waiting to be discovered. Solely based on the objective ‘truth’ of what knowledge is or is not, the positivism approach dissects the mind from the matter in order to distance the researcher from what is being researched (Riege, 2003). Positivism has its roots in natural sciences, and asserts that there is an objective truth in the real world that can be discovered, explored, observed and measured (Ryan, 2006). The outcome of such series of actions would be indisputable facts that can be independently verified through subsequent measurements. The researcher or observer is therefore objective and is perceived as part of the ‘instrument’ of measurement, who keeps to the rigid rules of the research design, and thereby has little or no influence on the outcomes of the study (Popper, 1972). Typically, in the study of natural sciences, where ‘hard’ evidence is required to substantiate hypothesis, and when quite a large population is to be investigated, researchers have historically used a positivist research approach, either to ascertain or reject a hypotheses (Kerlinger and Lee, 1964). In social sciences, where the objects of measurement may be opinions and beliefs, the positivist approach may equally be used to collect, collate and analyse a large amount of data. However, the studied sample would be expected to be representative of the entire population, so as to form a basis for generalisation (Easton, 2010). The studied phenomenon would be deemed ‘true’ across the population, until scientifically disproven (Sim, 1998). Individual opinions are represented and masked within the multitude of data, and are presented as uniform and universal in the studied population (Riege, 2003). The sample size can be statistically determined and external and internal validity confirmed, which provides the basis for generalisability (Lincoln and Denzin, 2008). The positivist paradigm in social science research assumes the ‘responsibility’ for ensuring reliability, validity, and generalisability, while quantification is maintained (Somekh and Lewin, 2011). The positivist also attempts to maintain objectivity, replicability and causality in the research study (Bryman, 1984).

3.3.2 Interpretivist Paradigm

The interpretivist, on the other hand, accommodates the variants of what knowledge exists and what the truths might be from an individual’s perspective. Interpretivism does not strive for an exclusive epistemological stance in social science. It rather embraces individualism and how people understand and perceive the world around them. Interpretivist paradigm purports that the social world is dynamic and, therefore, attempts to study social phenomena should take into consideration the constant evolution of this dynamism (Devine and Heath, 1999, p. 202). Travers (2001) rejects the notion of working with large data sets from an interpretivist’s perspective, suggesting that such approach reduces a social study into a “decontextualized” mass that makes it impossible to explore how respondents understand their activities and live setting in greater depth. Whereas the positivist would pursue a sampling approach that ensures inclusivity and representativeness; the interpretivist, on the other hand, would focus on selective inclusion of individual views. Some researchers claim that purposively selecting respondents into social science research studies does not detract from the robustness of the data and the findings (Travers, 2001).

TABLE 3.2: Comparison between positivist and interpretivist approaches in social science

	Positivism	Interpretivism
Philosophical foundation	Realism: the world is real and we can establish truths about this reality	Idealism: although the world is real, everyone see it from a different perspective, so it is impossible to establish universal truth
The role of social science	To uncover the universal truths that underlay society and how people conform to these	To show how peoples' different perspectives on life result in different social structures
Role of researcher	Neutral observer, with a detached view of the subject of study	Involved participant who plays an integral part within the research process
Theoretical approach	Rational approach, using scientific method and value-free data to reveal fundamental laws	Subjective approach, using induction and value-laden data to uncover underlying meanings
Methods	Experiments or mathematical models and quantitative analysis to validate, reject or refine hypothesis	Questions, discourses analysis and observations with qualitative and comparative analysis to reveal relationships and effects of their interactions
Analysis of society	Search for order. A system of shared values underlies and reinforces social structures. Society is governed by consensus	Search dynamics. A multitude of different values leads to complex interactions. Society is made possible by negotiation

Source: Walliman, 2011

The view across a population of participants may be well represented by one individual, or obtaining the opinions of a few members of the studied population may be sufficient to establish the validity of a phenomenon across the population. In such cases, amassing a large amount of data may prove to be a futile exercise, and the expended resources by so doing may not be justified. The social science researcher is therefore not a neutral outsider observing the social phenomena, but one who is part of the social system that is being studied, and whose interpretation of the world is shaped by their own personal beliefs and life experience (or biases). Interpretivism collates and synthesises the unique personal identity espoused by each individual in the study (Walliman, 2011). Nevertheless a researcher's worldview, Seale (1999) concludes that "...researchers can use methodological debates constructively in their research practice without necessarily having to 'solve' paradigmatic disputes…" (p. 3). This research resides within the interpretivist paradigm, as the simultaneous prevalence of multiple 'truths' cannot be eliminated. Hence caution is required in data analysis and interpretation of results.

3.4 Research Approaches

In social science, the research approach is a strategy employed by the researcher to achieve the research objectives. This includes the theoretical, political and philosophical backgrounds to social research and their implications for research practice and for the use of particular methods (Petty et al., 2012). The nature of the social question the research attempts to answer determines the research approach applied. A number of research approaches have evolved in the last couple of decades that have been used to answer social science questions. A non-exhaustive list of research approaches used in social science studies includes grounded theory, narrative, phenomenology, ethnography, and case study (Creswell et al., 2007); evaluation research (Rutman, 1977); action and participatory action research (Brydon-Miller et al., 2003); hermeneutics (Bernstein, 2011); and feminism (Hesse-Biber, 2013). The following sections will briefly discuss five of these approaches that are mostly applied in social science research studies of this nature. The philosophical considerations behind them are elucidated, after which justification for adopting an appropriate approach for this research project will be outlined.

3.4.1 Grounded theory

Grounded theory is used to explore participants' experience of a process, an action or an interaction shaped by the views of a large number of participants (Strauss and Corbin, 1998). The researcher enquires about participants' experiences and/or understanding of the phenomenon and attempts to deduct a pattern or commonality across their accounts, from which themes would emerge. The researcher essentially attempts to construct the theory from the data. Grounded theory is rooted in the field of sociology where the social scientist designs a social research aimed at formulating a generalisable theory on a social phenomenon (Morse et al., 2009). Grounded theory moves beyond the description of a phenomenon to generate or discover a theory that would broadly explain the social phenomenon (Creswell, 2007). Petty et al. (2012) identifies two types of grounded theory; the positivist and the interpretivist approach. While the positivist approach to grounded theory construction is process-driven (Glaser and Strauss, 1967), the interpretivist places more emphasis on the individual's perception and worldviews, by embracing multiple realities of the phenomenon as experienced by each of the participants (Charmaz, 2006). It is important to note that one of the greatest challenges social scientists face in undertaking social science research that applies grounded theory is that of positioning grounded theory on a continuum of 'accidental discovery' and 'deliberate deduction' of theory through empirical field investigations. The 'grounded theory' is arrived at by 'working' the data and allowing the data to 'spell' out the theory (Tan, 2010). Therefore for a grounded theory to be valid and produce reliable results, consistently over time, it cannot be divorced from the process through which it was generated. If the theory were a result of a deduction from a prior assumption, then it would be detached from the data and the social phenomenon it is trying to describe. If, on the other hand, the theory is arrived at inadvertently, then ascribing the term "grounded theory" to it does not afford it necessary validity for the theory to be tenable over time. The method of data collection in grounded theory is usually through interviews and this may be interwoven with the data analysis exercise as it may be necessary for the researcher to seek further empirical evidence, to substantiate the theory in the process (Corbin and Strauss, 1990). Grounded theory has been widely used in nursing research studies (Schreiber and Stern, 2001) and extensively within the healthcare sector (Starks and Brown Trinidad, 2007).

Undoubtedly, grounded theory provides rich data and a robust understanding of a social phenomenon; its use in this study, however, was dismissed for two reasons. First, it was not the objective of this research to develop a new theory. Secondly, while the data might have generated new information and themes, the newly derived theory, may not necessarily embody a basis to answer the research question. Even after accounting for the possibility to take an interpretivist approach, applying grounded theory to this study might only have illuminated a social phenomenon that is worth further exploring.

3.4.2 Narratives

Narratives in qualitative studies attempt to study the lived experience of an individual from their own perspective (Czarniawska, 2004). It is the reproduction of an event, a life story lived and told by the respondent. The researcher is essentially retelling the lived life experiences of the participants in the study. This kind of research is usually suitable for biographical studies and life history. Based on the topic of research, the research question and the context in which the study is situated, the social researcher recruits the participants for a narratives study. It is essential to note that in narrative studies, the researcher, an interpretivist, is immersed in the research process and as the story is 'retold', beliefs, values, biases, and the participant's world will be seen and explored through the lenses of the researcher. However, Kohler-Riessman (2000) suggests that the researcher 'brings' much more than subjective elements to a narrative study. For example, a lived experience may not be told in a chronological, spatial contextual, or even in a thematic form by the respondent. In order for the 'story' to gain scientific credibility, the researcher develops a framework through which the story is presented to the reader. Ollerenshaw and Creswell (2002) claim that what distinguishes a narrative research from other forms of qualitative research that attempt to elucidate individual live stories, is the way the researcher presents the lived experience in a chronological order. Due to the individualistic nature of this type of qualitative research interviews are usually the methods of data collection (Lillejord and Søreide, 2003). Document analysis, photographs, accounts of other people about the subject of study, and so on, may also be source of data (Brown et al., 2008).

3.4.3 Phenomenology

While narratives present an individual's story, based on the lived experience, the phenomenology research study focuses on an individual's experience about a particular phenomenon from various individuals in the study. The researcher's role is to mediate across the participants' unique experiences about the phenomenon, giving these experiences structure, through which the reader of the study gains an understanding of the collective meaning of the phenomena according to the participants' interpretation. Caelli (2001) claims that one of the greatest challenges for a researcher undertaking a phenomenological study is to position him or herself between the participants' description of the lived experience, and the researcher's beliefs and biases. While the immersion of the researcher in the data collection process will, inadvertently, shape the interpretation of a phenomenon, the representation of various participants' experiences is expected to reduce such biases and improve validity and objectivity of the study. LeVasseur (2003), on the other hand, asserts that some researchers may unmask the values they bring to a study, through their own interpretation of what Lowes and Prowse (2001) called "bracketing". Bracketing is an insertion of the researcher's own description of an experienced phenomenon. By bracketing out, the researcher reveals that their description of the phenomenon is not entirely value-free; the reader of such a study may thus be able to contextualise the researcher's story. While an individual's lived experience may be complex, phenomenological study may present the story as trivial and nothing new. Sokolowski (2000) noted that the presentation of an 'old story' could still "…be important and illuminating, because we often are very confused about just such trivialities and necessities…" (p. 57). Since it is the individual's lived experience about the phenomenon that is the focus of study, phenomenology is widely used in healthcare settings to understand how patients and healthcare personnel perceive a particular event, such as grief, and some types of diseases (Mackey, 2005).

3.4.4 Ethnography

Ethnography is a research approach that is used to understand a group of people collectively in a cultural setting. The overall aim of an ethnographic research study is usually to explore a pattern of behaviour, beliefs and language (McCurdy et al., 2004). The group would share such identity as living or working together in the same place, over a period of time, in the same context. The cultural characteristics of the group would be unique to a place (Burt, 1998), and enough time must have elapsed for the formation or crystallisation of the 'culture'. However, some authors do argue that the topic of an ethnographic study may not be literary 'culture' per se, but the exploration of the social behaviour in an identifiable group of people (Creswell, 2007). While ethnography has its roots in the natural sciences of physical anthropology (Hunt, 1981), it soon found its way into social anthropology studies (Gluckman, 1961) in the first half of the twentieth century. More recently, ethnography has been used to investigate nursing practices (Robertson and Boyle, 1984). The ethnographer immerses him or herself in the field of study by living among the group of study. Data collection is therefore mostly through participant observation, which may be supported by interviews and the use of artefacts and photographic images. In effect the research's aims is to understand why people do what they do in their natural habitat. Creswell (2007) distinguishes between the 'realist ethnographer' and the 'critical ethnographer'. The realist takes a step back from the participants and dissociates him or herself from the studied group. This is done to maintain 'objectivity' and the findings of the study is reported as facts. However, Williamson (2006) has noted that the ethnographic researcher should still be considered an interpretivist, as this form of lucid objectivity is only in the way the findings of the study are reported. This type of study would be shaped by the researcher's beliefs and biases, and to an extent be subjective. The critical ethnographer, on the other hand, does not mask their subjectivity of the subject matter. This form of ethnography is value-laden. As a matter of fact, the critical ethnographer uses their power position to study and report about groups, which otherwise would not have come to the awareness of mainstream literature, such as marginalised or deprived groups identifiable within a cultural setting or community.

3.4.5 Case study

Case study research is the study of a case within a real life, contemporary context (Yin, 2009). "Case study is a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon in its real life context, using multiple sources of evidence…" (Walliman, 2011). Robson (1993), on the other hand, see case study as a tool used "…to identify a specific form of enquiry…", in which a case is captured in its uniqueness, unstructured data is collected about the case and these data are qualitatively analysed. Unlike a survey-based research, where very little data is collected on a large number of 'cases', the most important feature of a case study research is that a large amount of in-depth information is collected, on quite a few cases, probably over an extended period of time, hence casual occurrences can be captured, as contrasted to a single point in a contact survey. Hammersley et al. (2000) argue that a case study research strategy is a useful means to answer the 'how' or 'why' question, whereby the researcher tries to study real world situations, without the necessity to influence the event under study. However, some research opinions question the suitability of a single case or a series of case studies to induce a hypothesis that can be used as a general description of behaviour or event types (Yin 2012). Another school of thought (Burns, 2000, Frankel et al., 2005) considers case study to be an inappropriate method of research because it does not offer an adequate basis for generalisation. Without the outright rejection of the suitability of case studies to answer research questions, Bresler and Stake (1992) suggest that "…within the boundary of a complex system, a case study is suitable when the focus is on the process, rather than the outcome, or on discovery, rather than confirmation, of a behaviour or event settings…". Noor (2008) contend that case studies offer the researcher the flexibility to explore the suitability of a new process or approach to doing things in an organisation, before its actual implementation, because due to its exploratory nature, new ideas and thoughts can evolve, which can be incorporated in the newly designed process. According to Creswell (2007), for a case study to provide an in-depth understanding of the case, a substantial amount of data must be collected and analysed. It may therefore be necessary for the researcher to employ multiple methods of data collection. A data collection primarily through interviews may be complemented by focus group, participant observation or document analysis.

The most daunting question a researcher, conducting a case study research, faces is to make a fair judgment of how many cases to study and how 'representative' the studied cases would be of the entire population. Creswell (2007) asserts that there is simply no answer to this question, because quantitative researchers' pursuit of 'quantity' is driven by the need for generalisability. Dawson (2002), claims that the extrapolation of the research results to an entire population is not and cannot be the objective of a qualitative case study research. The use of a single sample case study rather describes the particular situation, which can serve as a pilot case study and the information gathered thereby may form the basis of further research (Burns, 2000). In order to resolve the problem of the representativeness of a single case, Hammersley (1992) suggests that obtaining information about relevant aspects of the population of cases and comparing the studied case with them may reduce the effects of the peculiarity of the case study results. Silverman (2009), on the other hand, purports that the sample size in a qualitative research may not be strictly statistical, nor purely intuitive, as a carefully designed case study would be well founded.

Another challenge a case study researcher faces is the problem of system boundary or the contextual setting of the case study. It needs to be decided what aspects of the case is of interest for the study, whether the case should be studied in its entirety, if there are any chronological considerations to be made, what events would answer the research questions and what processes should be followed to achieve the research objectives.

3.5 Selecting a Research Approach

Based on the research approaches discussed above, the next task was to determine the most appropriate approach to answering the questions posed by this PhD research. This study requires the in-depth understanding of the nuances and the intricacies of the nursing practice environment, which might not be readily evident on a casual visit to the ward areas. An analysis of the job description of ward nurses would only have revealed what nurses are expected to do, and not what they actually do. Furthermore, it is important for the researcher to be aware that people's individual opinions and approaches to the same situational context would be very different for various reasons. For example, nurses with prevailing health conditions might perceive the ease or difficulty in performing certain tasks differently compared to those that are presumably healthy and fit.

Against this backdrop, questions need to be raised about the adequacy of any of the research approaches highlighted in this chapter, in order to select the appropriate research approach for this project. The ultimate objective should justify the research approach used. To choose the most appropriate research approach, Dawson (2009) suggests that the researcher should try to match the topic with the approach by asking the five ‘Ws’ questions; these are the ‘What?’, ‘Why?’, ‘Who?’, ‘Where?’ and ‘When?’ questions.

- **‘What?’** This is presumably one of the most important questions the researcher needs to ask at the early stages of the research project (even before the commencement of the design of the research). According to Moore (2006), it is seldom possible to arrive at the ‘what?’ of a research project without iteration and further fine tuning. However asking the ‘what?’ question helps move the research from the brainstorming and idealising stage to a more critical and pragmatic thinking level, that crystallises a research question, which may then be broken down into specific objectives.
- **‘Why?’** This question is probably the most sensitive and personal to the researcher than any other question. This is because the ‘why?’ question probes into the inner motivation of the researcher and, according to Dawson (2009), this question delves beneath identification of a gap in literature. The professional self-development of the researcher, the timing of the research topic, the potential impacts of the research project and available funding are all deciding factors.
- **‘Who?’** The ‘who?’ question is instigating the researcher to think through who the potential participants will be. Are they a unique group of people protected by law (e.g. children or vulnerable adult groups); are they living or working in sensitive areas or would sensitive information be obtained from them? (e.g. nurses working in hospitals). What would be the most appropriate mode of sampling and how would participants be recruited? Other ethical issues such as obtaining informed consent also need to be addressed at this stage (Beskow et al., 2004). Participants that are difficult to reach may slow down a project or bring it to a halt. This study recruited healthcare workers, who they themselves do not belong to a vulnerable group, but who are dealing with vulnerable patients. The researcher needs to consider the inadvertent and indirect interaction with patients. How this can be prevented or minimised must be given full consideration.
- **‘Where?’** This is probably the most relevant question in deciding the appropriate research approach. As suggested by Ponds et al. (2007), geographic proximity may be the deciding factor in research collaboration between organisations. This study is situated in Northwest England, and this needs to be factored in with respect to empirical primary data collection. The availability of potential data source from an appropriate NHS hospital in Northwest England needs to be carefully considered.
- **‘When?’** Finally, every research plan is time-bound. This PhD study was approved and funded for three years, so this is a determining factor when considering the type of research approach to adopt. The research design should be flexible enough to accommodate disruptions (Herroelen and Leus, 2005).

Answers to these questions supported the decision on the appropriate approach to this research. After in-depth considerations were given to the questions raised above, it was decided that a case study approach would be most suitable for this research project.

Yin (2014) suggests three instances when a case study may be desirable to answer the research question: (1) the main research questions are "how" and "why" questions; (2) a researcher has little or no control over behavioural events; and (3) focus of study is a contemporary (as opposed to historical) phenomenon (p.2). In response to question (1), firstly, this PhD study sought to explore and understand the nursing practice environment in order to develop a framework to support their work ability, hence it is important for the researcher to pose questions that delve into the how and why things happen within the wards. Regarding question (2) the researcher has no control whatsoever over the behavioural events in the study. Furthermore, it is not desirable for the researcher to exert any form of control on what is happening in the field of investigation. In response to question (3), while this study has sought to understand events that might have occurred in the past, the studied phenomena are expected to have transited to the present to offer a better understanding of the case. Yin (2014) went on to define case study research as "…an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident" (p. 16). A case study has therefore been used to answer the research questions in this research project.

3.6 Research Methodologies

The most common ways by which research studies are classified is based on the mode and strategy of enquiry. From this perspective, a research may be quantitative, qualitative or a combination of both (mixed methods). A quantitative research collects statistical data about a sample of a population of study. This type of research methodology is concerned with the measurement and the numerical counting of occurrences. A qualitative research methodology, on the other hand, tends to "…capture and understand individual definitions, descriptions and meanings of events…" (Burns, 2000). Qualitative research explores attitudes, behaviour and experience through specific methods of data collection such as interviews or focus group. Burns further noted that the qualitative researcher should be conscious of the subjective perceptions of those involved in the research – both the informant and the researcher. A mixed methods research marries the two methodologies by combining the characteristics of both. Debates abound in the research community about the choice of one over the other; some authors have simply advocated for the researcher's experience, skills, style, and, probably most importantly, their worldview, to be the dominating guideline for selecting the mode of enquiry (Morgan, 2007). While the researcher's skills set and personal profile may be one of the reasons for selecting the mode of enquiry, Sandelowski (2000) argues that these alone should not be the deciding factors. In some social science research methodology literature, there seem to exist a philosophical dichotomy between quantitative and qualitative research methodologies (Halfpenny, 1979). Some of these authors argue that the former is simply a numerical representation of a social phenomenon, while the latter group of authors describe social issues through individual opinions that are value-laden and subjective. Table 3.3 summarises the most frequently cited claims to describe qualitative 'as opposed to' quantitative research. The negativity of some of these features is evidently unmasked.

TABLE 3.3: Some claimed features of qualitative and quantitative research

Qualitative	Quantitative
Soft	Hard
Flexible	Fixed
Subjective	Objective
Political	Value-free
Case study	Survey
Speculative	Hypothesis testing
Grounded	Abstract
Exploratory	Explanatory
Inductive	Deductive
Interpretivist	Positivist
Relativistic	Universalistic
Pre-scientific	Scientific

Source: Halfpenny, 1979

Another trail of argument is the overt claim that quantitative research designs may be more suitable in natural sciences, while the social sciences would embrace qualitative research better. Both of these approaches have been widely disproved (Smith, 1983). For example, Bryman (2008a) takes the stance that the contrast often drawn up between quantitative and qualitative research is exaggerated. However, it is almost inevitable in contemporary research literature not to be confronted with this dualism of 'quantitative versus qualitative' research. It is therefore imperative for a researcher to situate the research study within a scholarly community. This is particularly true for a study like this research that cuts across disciplines, and in which theoretical underpinnings are adapted to explore the research question. Furthermore, positioning the research study would allow the researcher to explore philosophical assumptions relevant to the field of study. The research question, however, may not afford the researcher the comfort of simply choosing between any of these two methodologies, as certain social questions may simply be too complex to solve using any one particular type of research inquiry, in which case the researcher may consider combining the strengths of both quantitative and qualitative methodologies (Bryman, 1984). Many authors have claimed that the careful combination of both methodologies would make original contribution to knowledge (Roper and Shapira, 1999). Whichever methodology is adopted by the researcher for the inquiry, it must be made clear at the onset of a research project: if it is purely quantitative or purely qualitative, or a mixture of both. The research question determines if qualitative or quantitative types of data will be collected and how these should be analysed.

There are no specific guidelines to applying qualitative or quantitative research methodology. The question usually, is on what the researcher intends to garner from the investigation, what problems the research aims to solve, or what newer perspectives it attempts to open (Östlund et al., 2011). The answers to these questions would determine what types of data should be collected, which in turn informs the research design. In quantitative research, data is collected on a sample of the population and analysed. The results of such analyses are then extrapolated to form theories that can be generalised over the entire population. However, not every relevant piece of information in the study of a research can be precisely ‘quantified’. Judgmental and ‘soft’ perceptions in human nature - the essence of social sciences – is represented in beliefs and opinions, and may not be simply presentable as facts and figures. A qualitative research approach seeks to delve beneath the numerical representations of social phenomena.

TABLE 3.4: Criteria for quality in quantitative and qualitative research

Quantitative research criteria of quality	Qualitative research criteria of quality	Descriptor	Strategies
Objectivity or neutrality	Confirmable	The extent to which the findings are the product of the inquiry and not the bias of the researcher	Audit trail of the process of data analysis Triangulation Member checking Reflexive research journal
Reliability	Dependability (consistency, auditability)	The extent to which the study could be repeated and variations understood	Audit trail of procedure and processes Triangulation Reflexive research journal
Internal validity	Creditability (truth value)	The degree to which the findings can be trusted or believed by the participants of the study	Prolonged engagement Persistent observation Referential adequacy materials Peer debriefing Member checking Triangulation Negative case analysis Reflexive research journal
External validity	Transferability (applicability, fitness)	The extent to which the findings can be applied in other contexts or with other participants	Thick description Purposive sampling Reflexive research journal

Source: Petty et al., 2012

For both quantitative and qualitative research inquiries, what is important is the quality assurance of the research process and the results. Table 3.4 summarises the four main criteria needed in each case for both quantitative and qualitative research to be of quality, the descriptor of what the quality elements are, and the strategies a researcher may employ to achieve the relevant quality elements.

Lincoln and Denzin (2008) define qualitative research as that which is a situated activity that locates the observer in the world, who studies a set of interpretive materials that make the world visible. In the field of social science, researchers may observe a phenomenon from close range, by being immersed in the context and intricacies of the social realities; or they may take a vantage or distanced point of view which affords the researcher the opportunity to assume an 'objective' position and not be overwhelmed by the social process (Hoyle et al., 2002). Taking a close look at a problem, the social sciences researcher would be able to study how people feel, act and interact in a natural setting. Seale (1999) observes: "Seeking for evidence within a fallibilistic framework that at no point claims ultimate truth, but regards claims as always subject to possible revision by new evidence, should be a central preoccupation for a qualitative researcher…" (p. 52).

Engsted and Pedersen (2014) identified two approaches that may be followed by researchers when undertaking qualitative research in social sciences, from a methodological perspective. One is the deductive, theory-based approach, in which case predefined theoretical models or formulae are tested through empirical evidence. It is the analysis of the collected data that will suggest if the theory is a reflection of a 'real' social phenomenon or a 'myth' (Baldini and Poggio, 2014). The other approach is an inductive one, whereby the researcher collects as much information as possible about the social occurrence, and which, through in-depth analysis, may then generate a hypothesis. Brown (2003) cautions that a qualitative researcher must desist from setting up predefined concepts or theories of what is being studied in advance of the study, but should rather "…develop, test and refine hypothesis…", along the way so that the most appropriate concept may emerge. According to Baldini and Poggio (2014), a researcher may adopt a deductive methodological approach from the onset of data collection, by establishing predefined theories against which empirical evidences are sought. However, during the course of the data collection process, the researcher may shift to an inductive methodological approach, thereby deviating from pre-established theories and/or formulating newer hypothesis. Irrespective of the methodology adopted, Fisher and Copenhaver (2006) suggests that, for a qualitative research to be successful, the researcher must be apprehensive of the "validity and reliability of the data sources". In the study of social sciences, the researcher should endeavour to ensure the data and the data source are 'free of any bias or prejudice', save for the subjective opinion of the data source (participants). Sampling and establishing the representativeness of the samples is thus very crucial in order to obtain 'non-subjective' data. The quality elements for a quantitative methodology are objectivity, reliability, internal validity and external validity, while a qualitative research must be confirmable, dependable, credible and transferable for it to be verified as being of quality.

3.7 Selecting a Research Methodology

The selection of an appropriate research methodology is subject to the research question. The research question postulated in the study is to explore whether the architectural design features of hospital wards could be used to create a fit between ward nurses and the ward environment, by applying the P-E fit theory. In this respect, it is necessary to establish what constitutes the ‘Person’ and what the ‘Environment’ depicts in the P-E fit theory for this study. In the context of this PhD study, it argued that an enabling environment enhances work ability, while a ‘disabling’ environment poses an impediment to people’s abilities. Therefore, to create a fit between ward nurses and their work environment, this study must devise a way to establish what architectural design features of the hospital wards would be the ‘enablers’. This thus raises the question of what characteristics of the ’Person’ and what attributes of ‘Environment’ would be subject of empirical investigation in this study. It is conceptualised that the purpose of the ward environment is to support nurses to perform the tasks for which the spaces (ward elements) in the wards are designed. Therefore, this study must attempt to collect data on the nursing tasks and on the ward elements. Essentially, qualitative data will be collected relating to the nursing tasks (to denote the ‘Person’), while quantitative data will be collected on selected hospital wards (to depict the ‘Environment’). Data from both sources would then be qualitatively analysed to answer the research question.

To answer the research question, this PhD research study has attempted to develop a framework to support nurses working on wards within the NHS. The NTEA Framework consists of two dimensions. The first is the nursing tasks dimension, the second is the ward elements dimension. Therefore data collection strategy has been designed such that information can be gathered on the ward nursing tasks and the hospital ward elements. Qualitative data about the nursing tasks has been gathered through interviews and focus group, which has resulted in the development of Nursing Tasks Demand Matrix (NTDM). The ward environment, on the other hand, will be assessed by implementing the Ward Environment Assessment Tool (WEAT), which is a checklist consisting of more than 700 architectural design features, and administered through the post-occupancy evaluation of the hospital wards.

While this study has collected both qualitative data from participants (the ‘Person’), and quantitative data about the hospital wards (the ‘Environment’), it still resides within the qualitative methodology domain. However, due to the fact that complex information has been gathered to establish the assessment of the nursing tasks and evaluation of the hospital wards, which were then subjected to rigorous analysis, this ‘quasi’ mixed methods approach must be acknowledged. The corroboration of qualitative research methodology with quantitative data provides richness and allows more complexity in the approach to a study, when the variables cannot be simply translated into scaled numbers. However, Trumbull (2005) cautions researchers not to assume that qualitative research is simpler or quantitative research is more scientific. Scientific credence in any study depends, to a large extent, on the research design, including rigorous and verified methodology, quality of the data, and the skills and experiences of the researcher.

3.8 Research Design

Research design is the detailed and 'formalised' version of the conceptual framework of a research study. It outlines the steps that will facilitate the accomplishment of the research objectives. As suggested by Rowley (2002), research design defines "…the basic components of the investigation, such as research questions and propositions, appreciating how validity and reliability can be established, and selecting a case study design" (p. 18). It is the plan of work that describes the various activities undertaken by the researcher, including the possible trajectories at each stage of the research project. Research design may also contain guidelines that support the research and the actual decisions made in the research process. While research design is meant to be a handbook for the researcher, it may also serve as a means of justifying the decisions made during the research process. For instance, Bryman (2008b) claims that research design sets the framework for gathering and analysis of research data in the research process. It provides a perimeter or boundary of operation, which according to Creswell (2009), must be flexible enough to accommodate unforeseen circumstances and allow adequate responses to the situation for which it would be implemented.

The development of the research design for this project was driven by the objectives of the research project. There were six objectives to this research project, which were set in order to answer the research question of the study. Figure 3.2 presents an overview of the research objectives.

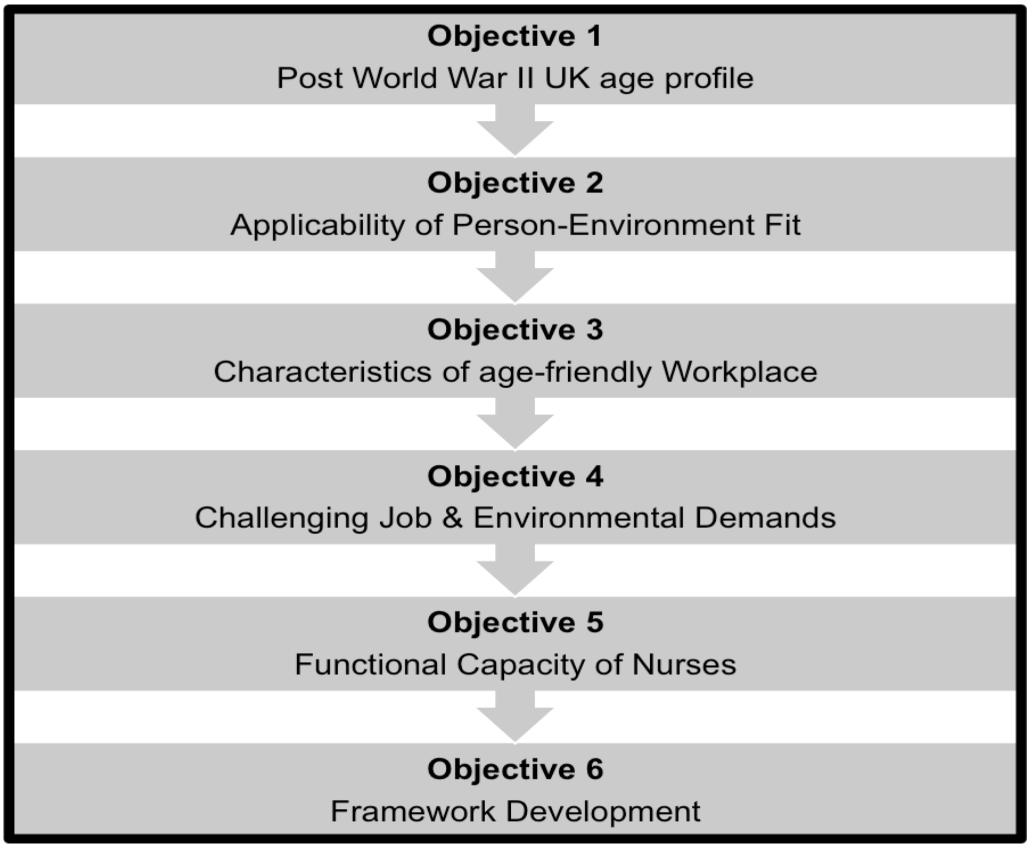


FIGURE 3.2: Overview of Research Objectives

It is important to mention at this stage that while the process of accomplishing the research objectives had been designed to be linear, which means that the achievement of one objective facilitates the next one in a chronological order, this had been not been entirely feasible in practice. It was necessary to revisit previously collected and analysed data to aid the better understanding of the current data being analysed. This makes the implementation of the research design iterative as well. This was notable in the construction of the NTEA Framework, whose two components were developed in a chronological order, however, their implementation were undertaken simultaneously. The Nursing Tasks Demand Matrix was developed before the Ward Environment Assessment Tool. NTDM and WEAT were used simultaneously to create and implement the NTEA Framework. The following sections describe the objectives of the research project and how these objectives have contributed to the development of the research design. Besides, these also provide descriptive explanations on how each objective has been accomplished.

3.8.1 Objective 1: Post World War II UK age profile

The first objective was to establish the changing trend in the age profile of the UK workforce. This objective is important in order to determine the overall rationale of this research study, its originality and contribution to knowledge. Essentially this objective set the scene for the research study, by exploring the impacts of an ageing population on the UK workforce. The ramifications of people living longer, the need for people to work longer, the effects of the imminent retirement of the baby boomers, the consequences of an ageing population on the healthcare system and the healthcare system response to the demands of an ageing population, were explored under this objective. To achieve Objective 1 required an extensive review of the literature. The literature review covered areas such as the trend of the UK ageing population and its impact on the workforce; government policy response to an ageing population; the gerontological theories of ageing; and the impact of these on the NHS and the nursing practice (Chapter 2).

3.8.2 Objective 2: Applicability of Person–Environment Fit

On an operational level, this study is situated within the built environment. The NTEA Framework will create a fit between older nurses and their physical work environment. It is therefore imperative to explore existing theoretical context that can be used to explain the question this PhD project aims to answer. Objective 2 was aimed at exploring and establishing if the P-E fit theory can be used as a guiding concept in this study. Granted that the P-E fit theory has been used to explain the relationship between older people and their home environment in a housing context (Iwarsson et al., 2007), it was presumed it could be adapted and used as a theoretical basis for this study. In addition, given that this objective required an in-depth review of relevant literature, the research design was used to source literature that was used to explore this area of the study in depth (Chapter 2).

3.8.3 Objective 3: Characteristics of an age-friendly Workplace

While the preceding objective established the applicability of the P-E fit theory, Objective 3 established the characteristics of an age-friendly workplace within the NHS. To achieve Objective 3, the research design assumed a well-established theoretical basis for the study in the preceding Objective (2). Since this objective can be achieved partly through literature review and partly through empirical fieldwork, the research design also considered the philosophical assumptions underpinning the study, the research methodology and methods of data collection and analysis. This stage of the project is called the workplace exploratory studies, as it is the first point at which empirical data was collected to inform the research. The empirical mode of data collection was through semi-structured interviews, as the interactive nature of this method of data collection offered the researcher the opportunity to probe previously unidentified trails in the study and allowed the researcher to steer the discussion back on track when needed (Kvale, 2007) (Chapter 4).

3.8.4 Objective 4: Challenging Job and Environmental Demands

Based on the findings of Objective 3, Objective 4 explored the job and environmental demands of the workplace for older nurses within the NHS. The research design considered how to further explore the findings from one stage of the research to the next stage. This was particularly important since the research project is qualitative, the study considered such aspects as objectivity, validity and reliability of the study findings. In a 'linear' research process, the corroboration of findings can be very crucial as a flaw in the data collection process, misinterpretation of data, or any other unforeseen circumstances may compromise further stages of the project and jeopardise the findings of the whole study. A focus group discussion was used as a means of data collection at this stage. The exploratory nature of this mode of data collection offers the researcher the chance to focus the discussion with a few participants at the same time, a process that Freeman (2006) claims promotes self-disclosure among participants on a given topic of discussion, by building on the group dynamics (Chapter 4).

3.8.5 Objective 5: Functional Capacity of Nurses

This objective helped to gain an in-depth understanding of nursing tasks directly from practising nurses, the nursing practice environment and further demands of the nursing jobs that may be specific to ward areas (and had not been captured in the preceding stages). Hence, the research design considered how the findings of the literature review and the exploratory studies of Objectives 3 and 4, would inform the accomplishment of this objective. Therefore, as a prelude to develop the NTEA Framework it was necessary to compile a comprehensive list of nursing tasks. The method of data collection for this objective was semi structured investigative interviews, with 20 ward nurses working in the NHS LTHTR, the case study hospital. The intent of this approach is to derive qualitative information from a large number of participants in order to enrich the research data and give rigour to the study. This stage established that in a typical NHS hospital ward, there are essentially 23 nursing tasks which nursing staff undertake on a daily basis.

The functional capacity of older nurses in the context of this study is conceptualised as the ability of nurses to perform their duties based on the patient-nurse interaction. It is presumed that the purpose of the nursing tasks, as a coordinated process consisting of activities to support patient in the therapeutic or healing process, would involve either direct or indirect interaction between patients and nurses. These patient-nurse interactions (PNI) could be in the form of patient care, patient surveillance and patient support, and are termed the PNI domains. For the purpose of the nursing tasks analysis, the researcher developed the Nursing Tasks Demand Matrix, which is discussed in detail in Chapter 5. Each of the 23 nursing tasks is then grouped into either 'multilateral' tasks or 'unilateral' tasks. Multilateral tasks are those nursing tasks that can be further divided into subtasks. Unilateral tasks are those tasks that are not divisible further into subtasks. In order to enhance the data management and analysis, each of the tasks is coded with a prefix of double letter (i.e., 'TM', for multilateral and 'TU' for unilateral task) and a suffix double-digit number. For example, the task 'personal care' is coded TM05, denoting it is a multilateral task and can be divided into 10 further subtasks. The number suffix denotes that it is the fifth item on the Nursing Tasks Demand Matrix list. Further, TU14 represents the task 'watching', a unilateral nursing task that cannot be divided into subtasks, and it is fourteenth on the Nursing Tasks Demand Matrix (NTDM) list, presented in details in Chapter 5.

3.8.6 Objective 6: Framework Development

Objective 6 is the ultimate goal of the research project; the preceding objectives supported the attainment of this final stage of the study. The NTEA Framework consists of two main components; the Nursing Tasks Demand Matrix NTDM and the Ward Environment Assessment Tool (WEAT). WEAT is a post-occupancy evaluation (POE) checklist and was conceived out of the need to objectively assess the adequacy of the ward environment to support nurses while performing the nursing tasks identified in the NTDM. WEAT consists of more than 700 carefully selected architectural design features, which were expected to support the personal constructs of hospital ward nurses. Therefore, besides the nursing tasks discussed above, another key outcome of the investigative interview was the identification of the ward elements. The ward elements are the spaces where these nursing tasks are most likely to be undertaken. Altogether 14 ward elements were identified. The adequacy of a ward element to support a nursing task is measured in a PCI score. The PCI score is achieved by administering the WEAT checklist through a post-occupancy evaluation of the hospital wards and denotes how well a ward element is fit for purpose in supporting nurses personal constructs (Chapters 6 and 7). It is the operation of the Nursing Tasks Demand Matrix and the administration of the Ward Environment Assessment Tool that supports the functioning of the NTEA Framework.

Lastly, after the NTEA Framework was developed, this process closed by inviting six stakeholders from the same NHS trust to a focus group session to validate the NTEA Framework. This is a very crucial stage of the development of the NTEA Framework, as this form of participant engagement gives the research rigour and validity (Polit and Beck, 2012). It is vital that the same set of participants interrogated at the earlier stages of the study were invited to validate the NTEA Framework. The participants undertaking the validation could have highlighted flaws or misinterpretation in the data collection or analysis process. Figure 3.3 shows the research design for this PhD study.

3.9 Case Study Research Design

While context, time and place may be different in case studies, this methodological approach of inquiry in social research has gain prominence over the last 20 years due to its usefulness in exploring and explaining single cases in such depth that would allow a broad perspective to be formulated on the studied phenomenon. A qualitative case study may be criticised due to its limited suitability to be used to generalise phenomena across a field of study, however by asking the ‘how’ questions it could reveal previously unknown phenomena and contribute to knowledge (Yin, 2014). Rowley (2002, p. 20.) takes a rather controversial stance with respect to the generalisability of the case study, arguing that “…the method of generalisation for case studies is not statistical generalisation, but analytical generalisation, in which a previously developed theory is used as a template with which to compare the empirical results of the case study" (p. 20). In the context of this PhD study, the P-E fit theory, as an established theory formed the foundational concept that support the empirical field investigation. Therefore, to determine the appropriateness of the research design for this study, it was necessary to first define the variables of each of the components of the NTEA Framework that will be measured, what the unit of measurement will be and how the results will be analysed and interpreted. Furthermore, the system boundaries of the variables must be defined, including the triangulation of the findings.

In this respect, each of the 14 ward elements identified in the investigative interviews was then assessed according to certain architectural design features. For this purpose three of the wards on which the interviewed staff nurses worked were selected. The architectural design features that were investigated in this study were derived from three main sources. The first source is the result of a thorough review of five built environment assessment instruments used in residential or rehabilitation healthcare facilities. These are: (i) Multiphasic Environment Assessment Procedure (Moos and Lemke, 1980); (ii) Professional Environment Assessment Procedure (Lawton et al., 2000); (iii) Therapeutic Environmental Screening Survey for Nursing Homes (Sloane et al., 2002); (iv) Sheffield Care Environment Assessment Matrix (Parker et al., 2004); and (v) Evaluation of Older People's Living Environments (Lewis et al., 2010). The second source was the interview participants' responses relating to the architectural design features they had highlighted as important for their workplace in the investigative interviews. These will be discussed in detail in Chapter 6. The third source was architectural design guidebooks pertinent to healthcare facilities design (Neufert and Jones, 1980, Littlefield, 2008); and relevant standards and manuals, such as: the 'Health Building Notes' by the UK Department of Health (2014); the 'Inclusive Design Toolkit' by University of Cambridge (2015); and the manual 'Accessibility for the Disabled: A Design Manual for a Barrier Free Environment' by the United Nations (2003). This process resulted in the compilation of more than 700 architectural design features to be investigated. Each of the 700 architectural design features was expected to satisfy certain constructs of user needs.

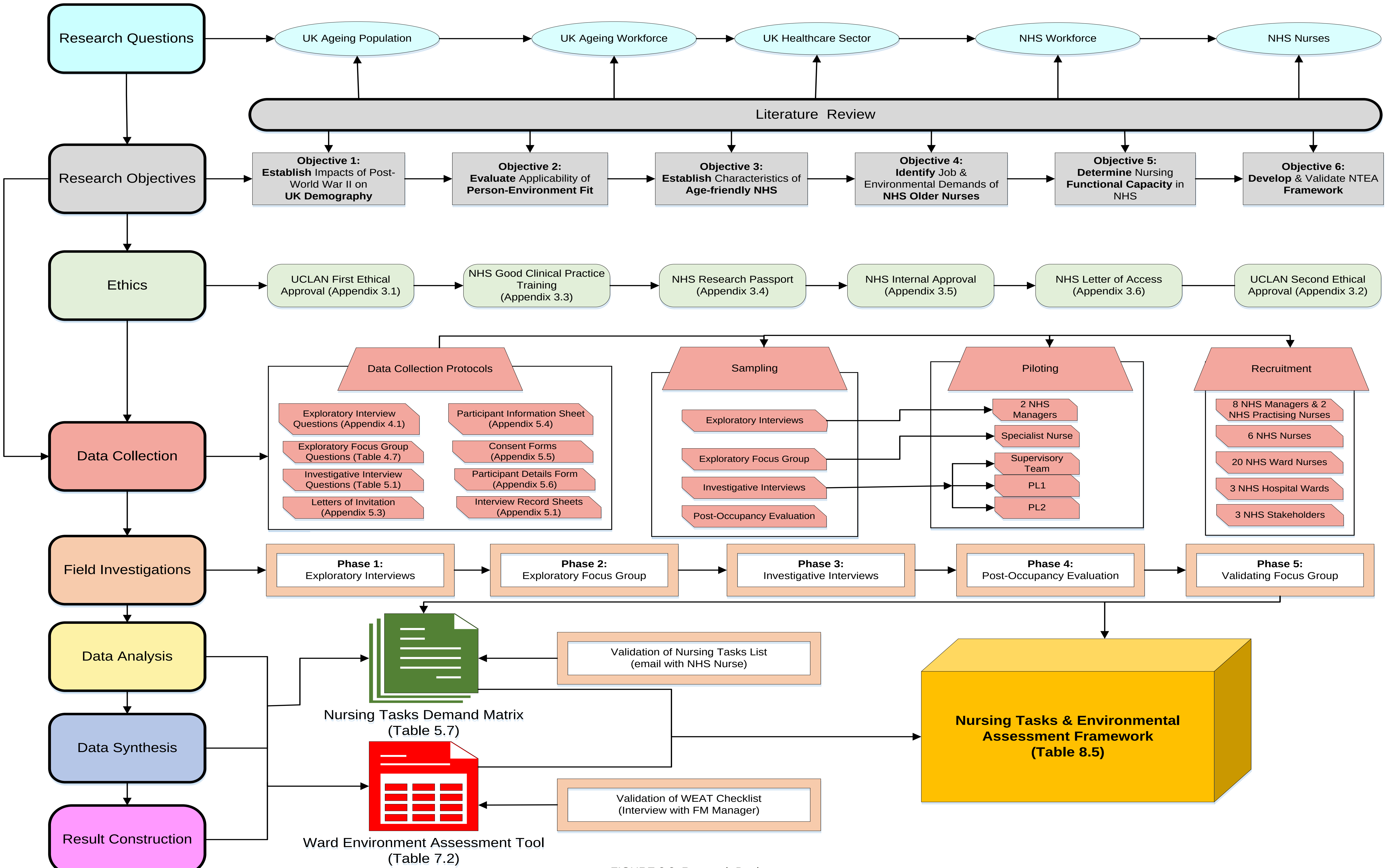


FIGURE 3.3: Research Design

3.10 Reliability and Validity in Qualitative Research

There are four stages of the research process, namely, data collection, data analysis, data synthesis and result construction. It was important to ensure that each stage of the process is error free and that quality is embedded in the whole process. As shown in Table 3.3, ensuring quality poses a great challenge for both qualitative and quantitative research studies, however, qualitative studies face a further problem of reliability and validation. Reliability refers to the extent by which the research results are replicable on repeated trials, whereas validity establishes if the study had actually measured what it had set out to measure and whether the measurement is accurate (Carmines and Zeller, 1979). Reliability and validity tests are rooted in the positivist research paradigm, which have traditionally been conferred with such scientific credence as ‘evidence’, ‘facts’, ‘truth’ or ‘objective’ (Kvale, 1995). Silverman (2011), cautions that while replicating a social context may be difficult, researchers should not fall into the trap of presenting these characteristics as solely attributable to natural sciences, as replication in natural sciences studies may not be a straightforward process either. Carmines and Zeller (1979) contend that even when the qualitative researcher overcomes the problem of replicability, there will always be a certain amount of chance error in any scientific study, and the goal of error-free measurement is unattainable. Silverman (2011), however, went on to argue that disregarding established methodical standards and the inability of the qualitative researcher to present audit trails of the research process, and therefore, not being able to demonstrate that a systematic approach had been followed in the study, does not absolve them of being discredited.

The challenge posed by reliability and validity is even more critical in a case study design as the use of a single case raises the question of rigour in the data collection and analysis process (Yin, 2014). There is a school of thought that questions the setting of ‘reliability and validity’ as the omnipotent criteria for establishing quality in qualitative research. Thomas (2016), for example, holds the view that the investigator needs not worry about reliability and validity in a case study research, as the investigation of a single case, if repeated by another person, cannot be expected to produce the same result consistently. Likewise, it should not be expected that measuring the same variables by a different investigator in a case study should yield similar results. This notion is partly supported by Morse et al. (2008), who observe that a myriad of quality criteria had emerged in order to resolve the ambiguous dilemma of reliability and validity in qualitative studies. Terms such as ‘plausibility’, ‘relevance’, ‘comprehensiveness’, ‘fitness’ and ‘auditability’ all converge to be ascribed the meaning ‘rigour’, as being an equivalent measure of quality in qualitative studies, as originally intended in the positivist worldview (Whittemore et al., 2001). The most important caution that needs to be demonstrated is in the area of research design and methodological approach; i.e. if the research had been designed in a way to ensure that reliability and validity are embedded in the whole research strategy.

Ensuring quality at every stage of a research project is a challenge for qualitative researchers. Unlike quantitative studies, where there are long established methodological approaches to verify a researcher's account, qualitative researchers are challenged with the responsibility of proving their claims. For example Seale (1999, p. 52) argues that "…if a research account makes claims about the nature of the social realm that it seeks to describe or explain, then readers should expect to find evidence in support of these claims". While there are statistical methodologies available to address the issues of reliability and validation in quantitative studies, qualitative researchers are challenged with the burden to demonstrate that their studies are reliable and have been validated. This may require a more subtle, sometimes cumbersome, approaches from qualitative researchers. The essence of validity, for example, as suggested by Long and Johnson (2000), is the credibility or the truth content of the study. The truth-content of a study goes beyond its replicability or accuracy, but requires the demonstration that the research has been undertaken by applying a rigorous methodological approach (Sharts-Hopko, 2002). This adherence to standard and quality assurance is true for any scientific study; hence the question is how to ensure a qualitative research had been undertaken with sufficient rigour. Golafshani (2003) argues that credibility in quantitative studies are embedded in the process, as the instrument of data collection is independent of the researcher; whereas in a qualitative study, the researcher is the instrument of data collection, hence, it is the researcher's responsibility to provide evidence of the truth-content of the study results. Morse et al. (2008, p. 16) stress the importance of applying reliability and validity appropriately to qualitative studies, and suggesting that the use of parallel equivalences may marginalise "…qualitative inquiry from mainstream science and scientific legitimacy".

Hence, in the context of this study, ensuring reliability and validation at every stage of the research process was central to the overall research strategy. The research design ensured that the data collection, data analysis, data synthesis and results construction phases are free of flaws. For each of these four stages, Barbour (2001) suggests four approaches that may be employed to ensure reliability and validity in a qualitative research study; namely purposive sampling, multiple coding, triangulation, and respondent validation, respectively. Table 3.5 depicts these four technical approaches to addressing the most common concerns regarding reliability and validation in qualitative research studies, and the realistic potentials of these technical fixes.

Granted that the research design had been sufficiently methodical to ensure that potential sources of errors are designed out of the process, the next challenge is for the researcher to ensure that the implementation of the research design is equally meticulous. Whereas there will always be some risk of fallibility in the execution of even a very sound research design, Morse et al. (2002) argue that by embedding reliability and validity in the execution stages, the qualitative researcher could be exonerated of any doubts of misrepresenting the research results, which could then be accepted as being the true likeness of the reality of the studied cases.

TABLE 3.5: Technical fixes used to confer rigour in qualitative analysis

Research Process	Technical Fixes	Concerns Addressed	Realistic Potential
Data Collection	Purposive Sampling	Bias	Enhancing sample coverage and providing a framework for analysis
Data Analysis	Multiple coding	Inter-rater reliability	Refining interpretations or coding frameworks
Data Synthesis	Triangulation	Confirmation or refutation of internal validity	Corroborating or, more often, refining findings
Result Construction	Respondent validation	Corroborating or, more often, refining findings	Corroborating or, more often, refining findings

Source: Adapted from Barbour, 2001

Thomas (2016, p. 76) argues that a case study researcher should be less concerned about the sampling, reliability and validity of their study, but should direct a more focused attention on "…conception, construction and conduct of the study." The following sections present how the data collection, data analysis, data synthesis and result construction stages had been anchored by each of the 'technical fixes' proposed by Barbour (2001), namely purposive sampling, multiple coding, triangulation and respondent validation, respectively. These technical fixes have mutually reinforced the embodiment of reliability and validity in this study.

3.11 Data Collection

This section presents the study settings, including the description of the case study (i.e. NHS Lancashire Teaching Hospital Trust); the five phases of the empirical data collection of the research process; the sampling strategies; and how purposive sampling has been employed to reinforce the reliability and validity of this stage. Data collection is understood as the empirical field investigation, during which the researcher interacts with participants and/or obtains information about the case of study.

3.11.1 Study Setting

The NHS Lancashire Teaching Hospital Trust (NHS LTHTR) was identified as the most ideal partner for this research. As one of the largest NHS Trusts in the UK, it provides healthcare services to more than 370,000 people in Preston and Chorley and offers specialist services to more than 1.5 million people across Lancashire and South Cumbria. The Trust operates from three sites; namely the Royal Preston Hospital in Preston; the Chorley and South Ribble Hospital in Chorley; and the outpatient Specialist Mobility and Rehabilitation Centre in Preston. The Trust employs more than 7,000 staff, of whom 2,200 (31.4%) are nurses and midwives. From the total number of staff 1,260 are 55 years or older, which constitutes 18% of the workforce (NHS LTHTR, 2015).

For the purpose of this study data collection was undertaken in the Preston and Chorley Hospital wards. The NHS LTHTR has been selected as a source of data collection primarily due to the well-established relationship between the University and the Trust and the proximity of the hospitals where participants were located. However, it was ensured, as described later in this chapter, that participants fulfilled the selection criteria for the study. Prior contact was established between the researcher and some members of staff of the Research and Innovation Department of the NHS LTHTR. A Facilitator was named to be the point of contact for the researcher, through whom participant recruitment was coordinated throughout the conduct of this research.

3.11.2 The Five Phases of Empirical Field Investigation

Figure 3.4 summarises the five phases of the field investigation, including the major outcomes of each phase, the main contribution those outcomes had made to the research process and how each contribution had informed the next phase of the data collection exercise. In Phase 1 an exploratory interview was undertaken with 10 NHS managers and nurses in order to glean an understanding of the NHS workforce in general. This phase was the preliminary/pilot study phase and established the probably research domain worthy of further investigation; i.e. older nurses. In Phase 2, focus group was conducted with six NHS nurses, in order to establish the challenging job demands and environmental demands of NHS nurses and why ward nurses exit their job role prematurely. Phase 3 attempted to understand the nursing practice environment; by investigating the types of tasks nurses perform in a typical NHS hospital ward setting. Phase 4 evaluated three selected wards, where the interviewed nurses in Phase 3 were situated. In Phase 5, six stakeholders working at the NHS Trust were invited to validate the developed NTEA Framework. The following sections explain how the various aspects of data collection supported the notion of embedding reliability and validity in the study. This includes description of the sampling strategy and recruitment of participants, and piloting of research questions prior to full-scale implementation.

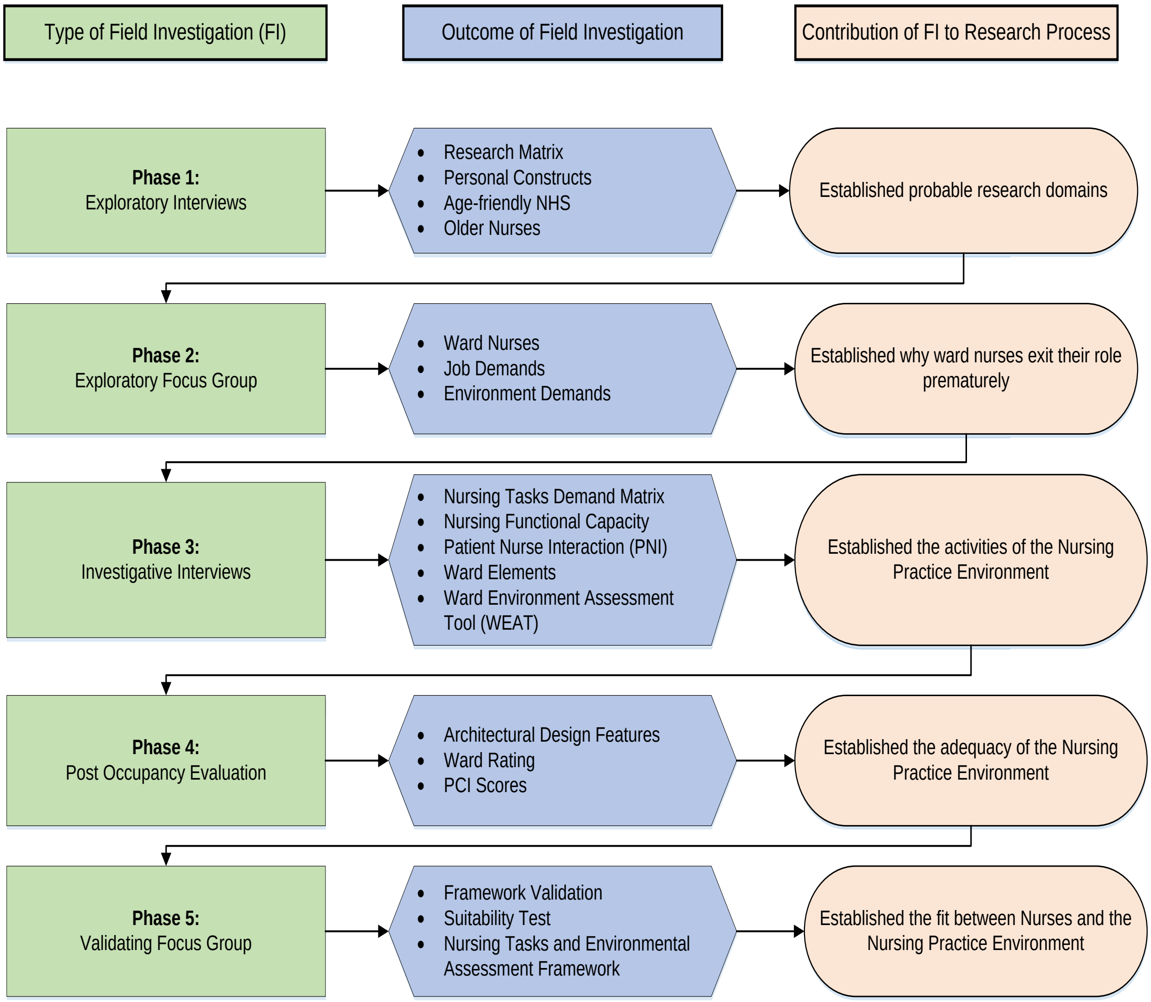


FIGURE 3.4: The Five Phases of Empirical Field Investigation

3.11.3 Purposive Sampling

A very important decision to make at this stage is to determine the number of participants that would generate useful data, with respect to richness, saturation, depth and quality for this study. The nature of this study lends itself to purposive sampling of participants. Purposive sampling is a deliberate, and careful selection of participants for a study based on predetermined criteria. It is used when there are limited number of participants available for a study and when informants are restricted geographically due to the nature of the case being studied. Whereas purposive sampling is often criticised for being inherently biased, a well-defined selection criteria, the quality of data retrieved, the aptitude of the researcher in the subject area, and the method of data analysis, may justify its application in qualitative research design. Therefore rigour is of crucial importance in data collection and analysis. To achieve rigour in qualitative studies, researchers often employ purposive sampling inductively until theoretical saturation is reached. However, it is quite a cumbersome task to define upfront what amount of data will result in effective saturation that will give rigour to a study. Purposive sampling in qualitative research enables the researcher to deliberately include outliers that might otherwise have been omitted. This approach ensures that deviant opinions are brought to the fore, thereby enriching the data by illuminating non-representative cases or members of the population (Barbour, 2001). Figure 3.5 depicts how reliability and validity have been embedded in every stage of the research process.

While qualitative research is not intended to create a basis for generalisation, it must be free of bias and subjectivity must be reduced to absolute minimum. Qualitative research attempts to understand contexts and phenomena, rather than advocating for a case of overwhelming representativeness of the datasets. A crucial stage in the data collection process that is fundamentally influenced by sampling is when data saturation will be reached. There is a school of thought that posits that reaching saturation is not just a by-product of the data collection process, but rather the result of a meticulously planned and intended stage of the research design, which will inform further courses of actions. Data saturation occurs when the collection of further data neither reveal newer information nor offer greater depth of understanding to the subject matter. At the sampling stage, the conundrum before the qualitative researcher is therefore to determine the sample size, i.e. estimate the number of participants that will yield data saturation in a study, given the available resources. Factors such as quality of data, scope of the study, nature of the topic, amount of useful information obtained from each participant, number of interviews per participant, qualitative research method used, the study design and use of 'shadowed data', would determine how quickly data saturation is reached. When data shadowing, qualitative researchers encourage respondents to narrate not just their own experience, but to share other subjects' experiences in their environment (Morse, 2000).

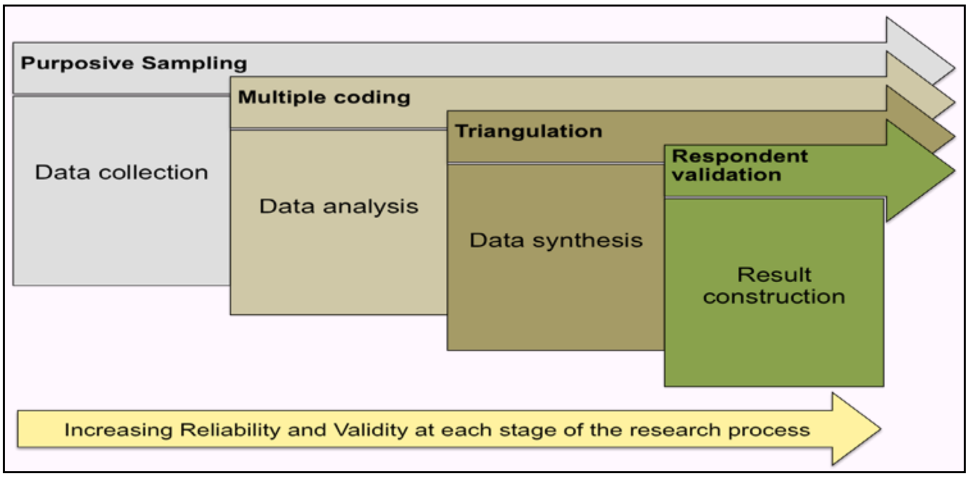


FIGURE 3.5: Embedding Reliability and Validity in the Research Process

Coyne (1997, p. 623) observed that "…in qualitative research sample selection has a profound effect on the ultimate quality of the research". It is not the number of participants, but rather the quality of information that can be obtained that serve as a prerequisite to quality. In fact, Mason (2010) warns against the risk of 'diminishing return', as increasing the sample size 'infinitely' would distract the researcher, who may lose focus of vital themes in the voluminous datasets. Purposive sampling is a data collection strategy that is used to investigate social phenomena when knowledgeable 'informants' need to be interrogated (Tongco, 2007). Some reseracher claim that a good informant should espouse certain qualities including the following: they should have knowledge of the subject; they should have capability to reflect and articulate their knowledge; they should be willing to respond to interrogative questions; they should be ready to participate in the study and finally, they should have the time to participate (Flick 2014). While applying these criteria, one thing that must be kept in focus is that the sampling is rich in relevant information.

To embed quality in each of the five phases of data collection of this PhD study, purposive sampling was applied. The researcher had established prior contact with the Facilitator within the Centre for Health Research and Innovation at NHS LTHTR. Participants and the object of investigation were identified through the Facilitator. The Facilitator had been briefed about the purpose and objectives of the research, and the about the profile of participants needed for interviews and focus group sessions. The possibility for subsequent visits to the same sites to undertake further data collection such as post-occupancy evaluation was also clarified in advance. For example, the profile of the participants for the investigative interviews, such as age, job role, length of service with NHS and experience working on wards, were essential in the recruitment process. Flick (2014) suggests seven different participant inclusion or selection criteria that qualitative researchers may use when applying purposive sampling as a method of recruiting participants for field investigation. These include (i) the purposive selection of **extreme or deviant** cases; (ii) **particularly typical** cases for an average or the majority of cases; (iii) selection by **maximal variation** in sample, by integrating a few but very different cases; (iv) the **intensity** by which the studied attributes are exhibited or possessed by the cases; (v) the selection of **critical cases** in which the relations to be studied are especially clear; (vi) particularly **sensitive cases** in order to build an argument for inclusion in further studies or programmes; and (vii) **convenience** selection criteria, in which the researcher accepts whatever is available as a source of information. It is suggested that a careful combination of any of these inclusion criteria gives rigour to a qualitative study. For a researcher to be able to purposely design the research sample, he or she must have a clear understanding of the circumstances that would influence the quality and quantity of the research data. Purposive sampling has been used in a number of healthcare research settings, including nursing research to demonstrate how nurses perceive and respond to organisational change (Smith-Blair et al., 1999). The following sections present how these inclusion criteria had been applied at each of the data collection phase in the field investigation.

3.11.4 Participants Inclusion Criteria

In social sciences research, Coyne (1997) suggests that a researcher may adopt a flexible approach to sampling and recruitment at the start of the study, focussing mainly on informants and sources of data with any useful piece of information that might lend the researcher an insight into the field of investigation, such as 'convenience', as proposed by Flick (2014). However, as the study progresses and the researcher becomes more adept with the field of investigation, participant recruitment criteria will become more definitive, and the researcher may adopt a sampling strategy such as 'critical sampling'. The participants inclusion criteria used to recruit participants and source data collection for this study are those proposed by Flick (2014), as highlighted in the previous section. These have been combined, where necessary, in each of the five phases of the data collection exercise of the research process (Figure 3.6).

In Phase 1, when the very little is known by the researcher about the research topic, it would make logical sense to devise a participant inclusion criterion that first exposes the researcher to the field of investigation. The purpose of data collection in this phase is to familiarise the researcher with the NHS research environment, understand NHS management view on the research topic and establish the characteristics of an age-friendly NHS. The participant inclusion criterion employed at this point is 'convenience', as data collection places more emphasis on management view on research topic and familiarisation of the researcher with research environment. Therefore the recruitment of research participants must account for these factors. In Phase 1, ten participants are recruited for the exploratory interviews, of whom eight are in managerial positions and two are practising nurses. The inclusion of practising nurses was intended to dilute NHS management's account of the subject at this stage of the research process, and thus obtain a more nuanced understanding of topic, it must be admitted that this inclusion might inadvertently nudged the research in its subsequent direction.

In Phase 2, after it has been established that nursing is the most widely practised profession within the NHS and, therefore nursing will form the focus of further investigation in this research project, the sampling strategy employed sought to recruit only nurses. The participant inclusion criteria adopted are a combination of 'particularly typical' and 'convenience'. The purpose of this field investigation is to identify challenging job and environmental demands of the nursing profession, through a focus group. It is supposed that the information required in this case should be 'typically' obtainable from an 'average' nurse. Furthermore, this stage of the study is exploratory. The researcher is still trying to understand the nursing profession within the NHS, at which point not much has been revealed about the profession. It is presumed that convenience inclusion criterion should also be used, which means that virtually 'any' participant working as a nurse within the NHS and willing to partake in the study would have met this inclusion criterion.

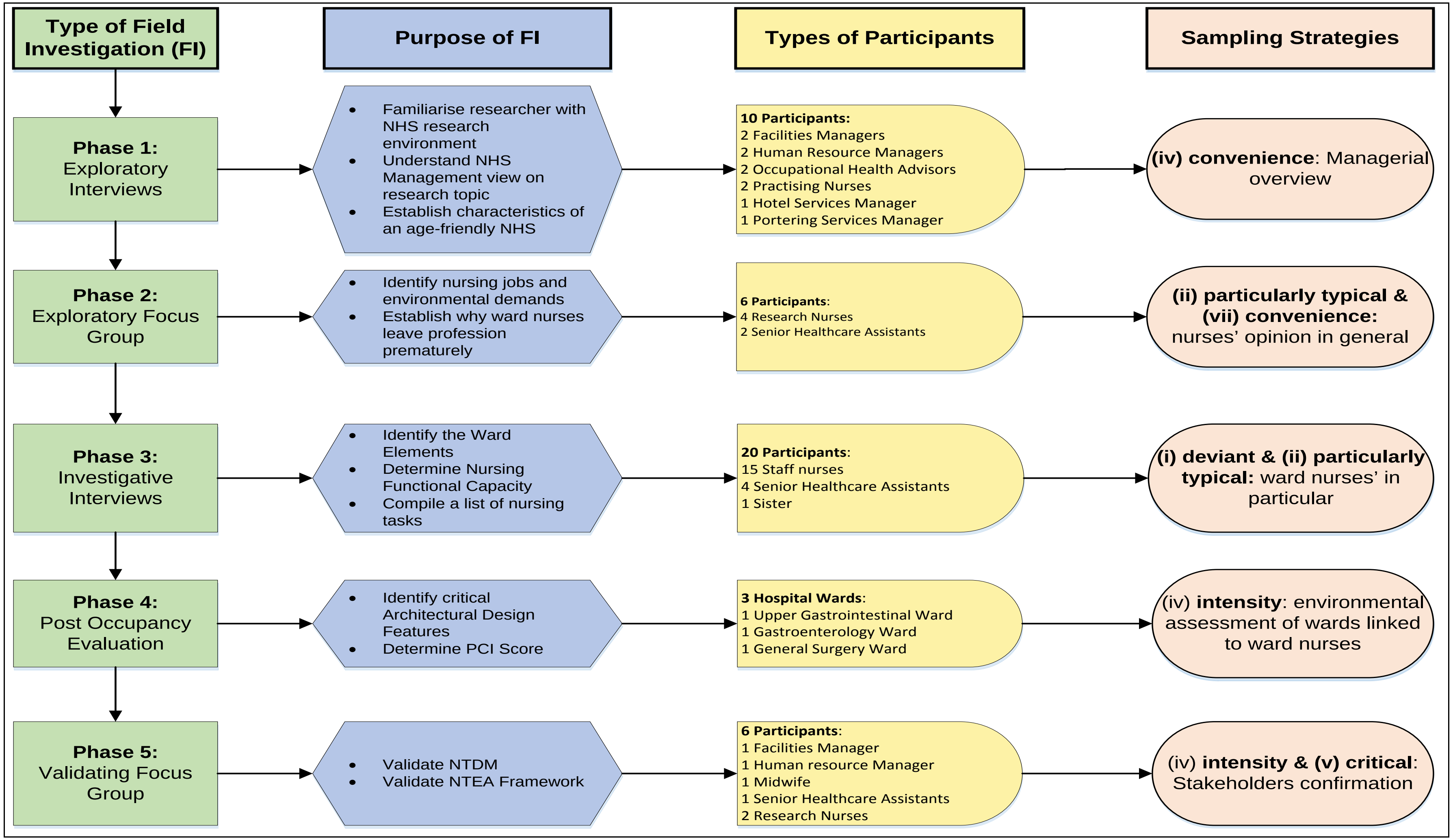


FIGURE 3.6: Participants Inclusion Criteria

In Phase 3, the study employed a combination of 'deviant' and 'particularly typical' participant inclusion criteria for the investigative interviews conducted. The purpose of the data collection at this stage is to identify ward elements, determine functional capacity of ward nurses and compile a list of nursing tasks. Evidently, this information is best obtained from the nurses themselves, hence the application of the 'particularly typical' strategy. In addition, it is vital to ensure information obtained at this stage is not 'gender-biased'. Data collection at this stage also applied a deviant 'sampling' approach in the recruitment of 20 ward nurses for the investigative interviews by including male nurses as participants. Employing this strategy is important as in a predominantly female profession like nursing, an alternative sampling strategy might not have included a male respondent. Hence, whereas the number of male nurses may be very low compared to their female counterparts, the systematic inclusion of male staff nurse opinions enriches the data, added rigour and ensures the 'exception proves the rule' optimum is accomplished.

In Phase 4, the purpose of the data collection is to identify critical architectural design features most pertinent to ward nurses in a ward environment. Clearly, the objective of the stage is to assess the ward elements. These ward elements are expected to be of those hospital wards where the previously interviewed ward nurses are working, therefore the wards must exhibit those architectural design features that are relevant to the ward nurses. Of the four wards where the interviewed nurses are located, three NHS wards were selected for assessment at this stage. The study applied the 'intensity' inclusion criterion, as these and only these three wards have the potential to display the characteristics that this stage of the study seeks to assess.

In Phase 5, the purpose of data collection is to validate the Nursing Tasks Demand Matrix and the Nursing Tasks and Environmental Assessment Framework. This stage of the field investigation was aimed at presenting the research findings to participants and inviting them to confirm if the researcher's understanding of the subject correlates with the information they had previously provided in the study. Therefore, it is paramount that the same set of participants are invited to take part in the study at this stage. The participant inclusion criteria adopted at this stage is a combination of 'intensity' and 'critical'. It is critical that the relationship between the presented findings and the participants is sustained through the validation process. As the stakeholders and beneficiaries of the study, it is crucial that the model presented met their needs.

3.11.5 Sample size

There are no rigid rules with regard to sample size in qualitative research studies. Unlike probabilistic studies, qualitative research requires a more nuance approach in determining the acceptable number of respondents. Qualitative researchers may resort to determining an arbitrary sample size, and continue to collect data until their expected, but 'ill-defined', saturation is reached. When interview is the mode of data collection in a qualitative study, there is a disparity in the guidelines for researchers with respect to sample size according to available literature. Some authors argue that as few as 12 interview respondents may produce sufficient data, rich enough to reach saturation. A qualitative researcher should, nevertheless, be aware that greater numbers do not necessarily guarantee richness of data (Guest et al., 2006). A single occurrence of a code may be enough to establish a phenomenon, a theme or a trail in the dataset. Hence, frequency of occurrence of data is of less concern to the qualitative researcher, because a single code may be sufficient to explain the process behind a topic. In this respect a qualitative researcher also needs to be apprehensive of thematic prevalence: whether the number of respondents suggesting a theme, be rated higher compared to the frequency of a code occurrence. This is because one participant using the same expression more often in the same interview is of less relevance, compared to a situation if most respondents express the same view with fewer occurrences or codes.

A total number of 38 participants were recruited, and 3 NHS wards were identified, for this study across the five phases of data collection as follows:
Phase 1: Exploratory Interviews: 10
Phase 2: Exploratory Focus Group: 6
Phase 3: Investigative Interviews: 20
Phase 4: Post Occupancy Evaluation: 3 wards
Phase 5: Validating Focus Group: 6

It is important to note that in order to ensure participation consistency, four of the six participants in the Validating Focus Group had previously participated in the study. Therefore, whereas these four participants participated in the study twice, once at the exploratory and the investigative phases, then during the validating focus group, they have only been included once, to eliminate repetition.

In Phase 1, 16 participants were contacted, but 10 were selected, as the sampling strategy employed at this stage was ‘convenience’, the main selection criteria being that a dominant proportion of participants must be in managerial positions, as explained in section 3.11.4 above. Therefore eight of the 10 participants were in managerial positions. Once, the researcher was able to interview 10 participants, data collection for this stage was halted. In Phase 2, 15 participants were initially contacted, of whom eight responded as willing to participate. However, only six attended the focus group session, all of whom met the selection criteria, as the participants inclusion criteria for this phase was ‘particularly typical’ and ‘convenience’, the main focus being on recruiting nurses. In Phase 3, a covert approach was used to recruit participants. Altogether, 25 participants were contacted, 21 ward nurses were interviewed. However, one of the interviews was discarded, as the interview was of suboptimal quality. Therefore 20 ward nurses were included in the final data. In Phase 3, the sampling strategy used was ‘particularly typical’ and ‘deviant’, selection criteria being that all participants must be ward nurses, of whom approximately 10% must be male ward nurses, to ensure ‘non-representative’ members of the population were also recruited. Of the 20 ward nurses, 2 were male. In Phase 4, the post-occupancy evaluation was conducted on three of the four wards from where the ward nurses were recruited in Phase 3. However, the reason why the fourth ward was not used at this stage was because it is an out-patient ward, so its services and parameters were different compared to the other three inpatient wards. This outpatient ward was deliberately included so the researcher could glean the opinion of other participants, and thereby enriching the data. In Phase 5, the sampling strategy employed was to ensure participants for the validating focus group were mostly expected to have been interrogated at an earlier stage of the study, as respondent validation means those who partook in the study earlier could offer authentic opinion about the validity of the findings presented.

3.11.6 Piloting

There are a number of reasons why a pilot study is conducted prior to the main study. Among others, a pilot study may be used to develop and test the adequacy of the research instrument; estimating the sample size and/or response rate; and assessing the feasibility of the main study (Van Teijlingen and Hundley, 2001). However, many qualitative researchers resort to using pilot studies by default rather than by design without thorough justification for how a pilot study would inform or facilitate the research design (Sampson, 2004). When purposive sampling has been used and where the ultimate number of participants for the main study is limited, a pilot study could be particularly useful in identifying key areas of focus prior to the commencement of data collection. Furthermore, in studies where the researcher is an ‘outsider’ in the subject area, such as in this PhD study, a pilot study could help clarify important terminologies that are used in the profession, while serving as a form of initiation to, prior to immersion in, the main study. The following sections describe how each of the first three phases of data collection have been piloted.

3.11.6.1 Piloting – Exploratory Interviews

In Phase 1, an interview question schedule was prepared for the pilot study to cover all the areas of enquiry for which participants’ views would be sought. The interview questions underwent critiques before the final version was arrived at. In order to ensure that the predesigned interview questions (see Chapter 4 for samples of the exploratory interview questions) were fit for purpose and understandable by the interviewees, it was essential to test these questions before applying them for data collection. Separate interview questions were designed for each of the identified participant groups. While there was some overlap across the questions asked each group of interviewees, some other questions were targeted mainly at specific groups, because it was presumed, their position makes the question more relevant to them. The Facilitator at the Research and Innovation Department of NHS LTHTR helped identified two managers among her colleagues who volunteered to participate in the piloting. After piloting, the modifications to the interview questions, suggested by the two pilot volunteers, were subsequently implemented.

3.11.6.2 Piloting – Exploratory Focus Group

In Phase 2, the focus group questions were piloted through an interview that was aimed at testing its relevance and effectiveness. The participant that volunteered for the pilot is a practising specialist nurse within the NHS LTHTR, who had more than 20 years work experience as a nurse. The participant for the pilot interview suggested minor modifications to the questions before administering, which were applied. This participant was also one of the respondents in the exploratory interview study in Phase 1.

3.11.6.3 Piloting – Investigative Interviews: Stage 1

In Phase 3, the piloting of the investigative interviews was conducted in three stages. At the first stage, members of the supervisory team of this PhD study undertook the first review of the interview schedule. Important observations were made and recommendations for modification suggested. For example, the use of so-called ‘double-barrelled’ questions was highlighted as a source of distortion to the generated data, as participants may put more emphasis on one aspect of the question, while giving incomplete or suboptimal responses to the other part of the same question. It was raised that participants with health problems that affect their work ability may respond to certain questions that needed to be contextualised. It was suggested that direct references to participants’ health condition must be avoided. These and other issues that may potentially cause a flaw in the data collection process and undermine the quality and richness of the data were raised by the supervisory team and addressed by the researcher. This first stage of the interview question review generated further questions and required that some other questions be reframed.

3.11.6.4 Piloting – Investigative Interviews: Stage 2

For the second stage of piloting, a qualified registered nurse with more than 30 years of practical experience in nursing was interviewed. This participant has been coded PL1. PL1 was in private practice/consultancy at the time of the pilot interview, however, her experience as a former lecturer in nursing training provided invaluable insights into the research design that helped to further develop the investigative interview questions. PL1 has been involved with the NHS either as an employee or a consultant since 1981. This second stage of piloting helped to clarify the use of certain terms, expected in practice in order to avoid misinterpretation. Also, the question relating to the ‘health’ of participants was flagged by PL1 as being sensitive and it was suggested that the researcher should be aware that participant responses would be dependent to a large extent on their age. PL1 noted that while a participant may be healthy, their environment might be disabling rendering them unfit to perform certain tasks on the wards. Moreover, such form of disablement might be attributable to the environment and be a relative function of age. PL1 gave accounts of personal experience where certain tasks that she was performing at age 21 were less demanding on her body physically, but as a 50-year old, she could feel the impacts of the same tasks more on her body. Nevertheless, PL1 confirmed that establishing individual circumstances regarding their health status is a valid and very relevant question as further responses may be seen in the context of the respondents’ health condition. In addition, PL1 gave instances in her environment whereby colleagues who are not as fit as she was were leaving the profession as they had deemed the work environment not supporting enough. PL1 suggested splitting the question on health into two. Participants should first be asked if they are fit and well and their response to this question should be captured without giving the participant any clue on the second part of the question that would then enquire about their fitness to function in their work environment. Since health is one of the three attributes of an age-friendly work environment, as identified in the exploratory studies (in Chapter 4), the researcher appreciated that further thoughts were invested in the designing of the question relating to health.

The final outcome of the question on health, for instance, meant that health was only implied and not mentioned. This approach offered participants the latitude to answer questions concerning their health and offer further insights into the topic, if they deemed it necessary. PL1 pointed out that the wording of the question should mirror its sensitivity and that the researcher's objective intention with this question should be reflected in the degree of tactfulness applied during the empirical fieldwork. This stage of the piloting helped to generate further questions and the final interview schedule was constructed with 29 questions (Please see full list in Table 5.1 in Chapter 5). Finally, it is noteworthy that one of the resultant benefits of this second stage of piloting is the provision of further leads to potential participants for the pilot study. The researcher was able to recruit another nurse for the third stage of the piloting through a lead provided by PL1.

3.11.6.5 Piloting – Investigative Interviews: Stage 3

The third and final stage of the pilot study was undertaken with a participant (PL2), who had more than 30 years work experience as a nurse, and was working as an orthopaedic ward nurse in another NHS hospital. While this stage of piloting did not generate new questions, PL2, nevertheless, identified issues that were already highlighted at the earlier stages of the review/piloting process by the supervisory team and PL1. For instance, it was interesting that PL2 also found the double-barrelled questions ambiguous. The most important information gleaned from PL2 in the third stage of this pilot was with respect to the tasks that nurses perform, which is one of the major objectives of the interviews. PL2 reiterated that nursing practice today is very much different compared to what it was a few decades ago. Nowadays, the main focus of patient care on wards is on post-operative discharge. This means that only patients that require high level of nursing are kept in hospitals, which make the nursing work more demanding. PL2 suggested that the interview questions should consider this paradigm shift in nursing roles, as it serves as the backdrop for all nursing tasks and activities on surgical wards across the NHS. Additionally, the coordinating role of staff nurse was emphasised, who are situated at the centre of patient care, by liaising and communicating with all members of the multidisciplinary team. At this third stage, the number of questions compiled remained 29; however the foci and the emphasis of the questions were moderated by the pilot interviews.

3.12 Ethical Approval, Informed Consent and Recruitment

In research studies involving human subjects, there are legal as well as ethical considerations that must be made prior to the commencement of data collection. This includes obtaining relevant ethical approval, seeking and securing participants' informed consent and recruiting participants for the study. From a legal perspective, participants in a study must be aware of how information collected from them, and in particular about them, will be used. In addition, according to the Data Protection Act 1998, there is a legal requirement that people volunteering to take part in a research study be informed about how their anonymity will be protected (www.legislation.gov.uk, 1998). However, the protection of the rights of human subjects in research activities transcends legal compliance. The researcher has a duty of care to ensure that participants fully understand the purpose of the study and that they are in a position to give their explicit or informed consent to participate in the study. From an ethical perspective, participants must be made aware that their participation is voluntary and that they may request to withdraw from the study at any time, without the fear of prejudice or retribution. It is also paramount for consumers of a research study involving humans to be aware that the information gleaned from participants during the study had been obtained in a fair environment without duress, and that participants were by no means coerced, or otherwise influenced, in any way to act against their will, or to advocate to promote the study in any infinitesimal way.

The first international ethical guidance on research with human subjects, the Declaration of Helsinki, states that: "…each potential subject must be adequately informed of the aims, methods, sources of funding, any possible conflicts of interest, institutional affiliations of the researcher, the anticipated benefits and potential risks of the study and discomfort it may entail" (World Medical Association, 1964, p. 373.). While the ethical guidelines set out in this declaration were originally intended for medical research, it has been argued that social sciences research should be equally compliant (Faden and Beauchamp, 1986). The following sections discuss the process by which ethical approvals and the participants' informed consent were obtained, and how participants were recruited for this study.

3.12.1 Obtaining Ethics Committee Approval

According to the University's Research Protocol, the prerequisite to the commencement of data collection is to obtain an ethical approval for the study from the appropriate Ethics Committee. The ethical approval for this study was issued in two stages. While it had been determined that data collection for the study will be conducted in five phases, in the first instance, ethical approval was obtained only for Phase 1 (exploratory interviews) of the study. This is because it was not possible to anticipate the outcomes of the exploratory interviews; hence sufficient flexibility had been designed into the data collection process to accommodate the possibility for amendment and fine-tuning of the procedural approach. Please see Appendix 3.1 for a copy of the First ethical approval. Based on the results of the exploratory interviews, a new application was submitted for the Second ethical approval. At this point major crossroad decisions had been made on how to proceed with the research study, therefore the Second ethical approval covered the project till the end. Please see Appendix 3.2 for a copy of the Second ethical approval.

3.12.2 Obtaining NHS Approval

While the prerequisite to commence data collection was to ensure the University's ethical approval had been obtained, it was also a requirement of the NHS that NHS clearance and approval be granted prior to the initial data collection exercise. Access to NHS premises and participants could not be granted until the researcher had fully complied with NHS ethics and protocols. Please see Figure

3.7 for an overview of UCLAN First ethical approval procedure and the research design for the exploratory interviews.

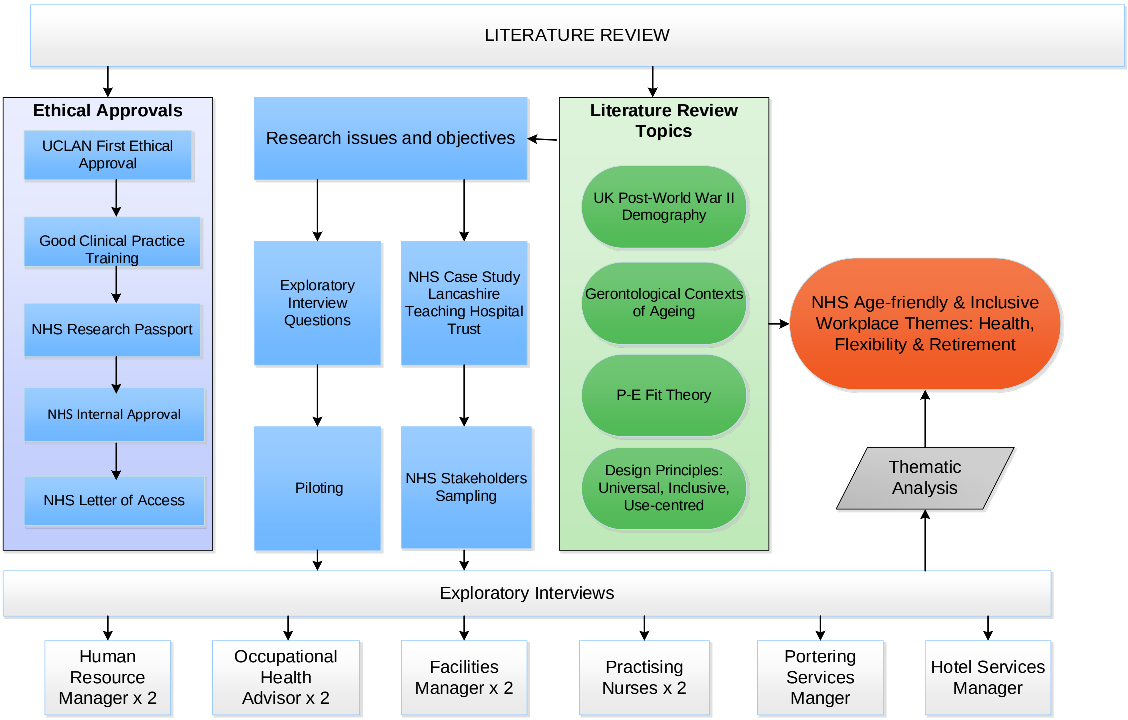


FIGURE 3.7: First Ethical Approval Procedure and Research Design for Exploratory Interviews

First the NHS required that the researcher undertook a training designed for external people advocating to conduct research within the NHS. This training is called ‘Good Clinical Practice’ (GCP) training. GCP is an online training with various modules and can be taken over a number of days. Topics covered include ‘Introduction to Research in the NHS’, ‘Good Clinical Practice and Standards in Research’, ‘Study Set-up and Responsibilities’, ‘The Process of Informed Consent’, Data Collection and Documentation’, ‘Safety Reporting’ and ‘Summary’. By completing these modules, the researcher was able to understand the NHS research environment and the terms used within NHS for certain practices and procedures. Please see Appendix 3.3 for a copy of the ‘Certificate of Completion’ of the GCP training. Upon the completion of the GCP training, a formal application was filed to obtain NHS ethical approval to conduct the study. Evidence of the researcher’s capability to conduct research within NHS was by issuing the Research Passport. The Research Passport (Appendix 3.4) is a document, which allows researchers to access designated NHS premises to undertake research within 3 years of its issuance. Preconditions for issuing a Research Passport was for the researcher to undertake a health assessment and have a Disclosure and Barring Services (DBS) clearance. The issuance of NHS Research Passport was followed by an NHS Internal Approval (Appendix 3.5), after which a Letter of Access (Appendix 3.6) was issued, which granted access to specific areas and sites where the interviews would be conducted. Given that the source of data collection is a sensitive area where vulnerable people are located, it was important to ensure care is taken that patient rights, the rights of other employees, or the rights of any other third party, on NHS premises are not infringed at any point in time during the data collection period. Therefore a lot of thoughts have gone into ensuring that sensitive data are not collected from participants. In particular, no data was collected on patients and no interactions were necessary with patients during the data collection process.

3.12.3 Informed Consent

The ethical challenge of ensuring participants are well aware of the ramifications of their decision to take part in a research study is addressed through the institution of informed consent. “Informed consent is the process of sharing essential information with study participants, so they may make rational choices among multiple options in their own perceived self-interest” (Beahrs and Gutheil, 2001, p. 5.). Informed consent is a rights-based approval given by a competent and autonomous individual to control what happens to their body and persona.

Sin (2005) contend that obtaining ethics committee approval and ensuring participants sign a consent form should not be interpreted by a researcher as being synonymous with informed consent. Indeed Sin (2005) suggest that it is now commonplace in social science studies for researchers to assume that any ‘normal’ individual has the ability to decide if they wanted to participate in a study or not, and therefore, reserving the informed consent regime to participants without the capacity to make informed decisions and minors. This is unveiled in the following statement: “Unless there is evidence that a potential participant lacks decision-making capacity, investigators are justified in assuming his competence” (Bromwich and Rid, 2015). However, it is argued that too often participants deemed ‘competent’ and ‘normal’ may still not be in a position to give their informed consent even after all legal procedures and ethical protocols have been observed. A researcher cannot be entirely relieved of their responsibility to ensure that even competent and normal individuals have a full understanding of what they are consenting to. The informed consent process should therefore require the full disclosure of what the study entails to participants in their own ‘lay’ language and level of understanding. The researcher need to be cognisant of the capacity of the potential participant to fully understand the information being provided about the research, and make a judgment call on their age, level of education, ethnic or cultural background and overall familiarity with the research topic. Clearly, this researcher responsibility goes beyond ensuring participants sign a consent form.

In this PhD study, while the process of obtaining the informed consent of participants began with the research design, it was ensured that each participant’s actual consent was sought and obtained prior to the commencement of data collection, for each phase of the research process. For instance, all initial contacts with participants were made through a Facilitator from the Research and Innovation Department of NHS Lancashire Teaching Hospital Trust, so no ‘cold calling’ was performed at any stage of the study.

Prior to the commencement of a data collection session, the researcher would ensure participants were given background information about the study. For example, in the exploratory interview stage, each interviewee was briefed about the rationale for conducting the research with particular reference to current public discourse of the research topic. Furthermore, prior to the start of the exploratory focus group, participants were shown a short (three-minute) video of the current situation of the NHS ageing workforce. These preparations were intended to provide background information to the study and also stimulate participants' thoughts on the topic.

On the day of an interview or a focus group session, the researcher would show the participant a copy of the participant information sheet (PIS) that had been sent to them earlier through the Facilitator. Please see Appendix 5.4 for a copy of the PIS prepared for the participants in the investigative interviews. The content of the PIS for each phase of the data collection process has been adapted to suit the particular stage of the research. Essentially, the PIS details the purpose of the research, the rationale, and why participation in the study was being sought, and most importantly the participant's right to withdraw from the interview or focus group even after the data collection activity, and their right to lodge a formal complaint about the study is reinforced. However, each participant was made to understand that it would not be possible to remove anonymised information once data processing had been conducted. To ensure a participant had full knowledge of what the study entails, these points were verbally reiterated at the beginning of each data collection session.

The researcher would then ask the participants whether they understood what had been said and if they had any questions about the study. When questions are raised the researcher would attempt to answer those questions satisfactorily, and restate if participants had further concern about the study. If further queries were raised, the researcher would attempt to clarify those circumstances, before presenting the participant with a copy of the consent form. Please see Appendix 5.5 for a copy of the consent form prepared for participants on the investigative interviews phase of the study.

Finally, the informed consent process also required that the researcher informed the participants about the need to audio (or video) record each session. The researcher explained to each participant that the audio/video file would be transcribed in order to facilitate the data analysis process. Participants would be asked if they had any objections to the electronic recording of the session. After participants had expressed their explicit consent, the researcher would then start the recording of the session, at which point the researcher would again asked if participants were happy to be audio (or video) recorded, to evidence the consent was also recorded. This step was taken to ensure that participant written consent to participate in the study and to permit the electronic recording of sessions were backed up by audio recordings.

3.12.4 Recruitment

Recruitment of participants for this study was conducted through the Facilitator from the Research and Innovation Department of NHS Lancashire Teaching Hospital Trust. This Facilitator was made to understand what the requirements were regarding the profile of the participants for each of the five phases of data collection process. For example, while recruiting participants for the Investigative interviews in Phase 3 (Figure 3.4), the Facilitator got in touch with ward managers across the Trust through the internal mailing system. An introductory meeting was arranged by the Facilitator with potential ward managers who showed prior interest in the study and had in principle agreed to the interviews being conducted with their staff nurses. At this initial meeting interview days were agreed, when the researcher would go to the ward to interview volunteering staff nurses. Interested ward managers were sent an Invitation Letter (Appendix 5.3) and the participant information sheet (Appendix 5.4), which they were asked to distribute among their staff members that have shown interest in participating in the study. Participation in the study was not restricted by age at any point. However, participants' age group was captured using the Participant Details Form (Appendix 5.6) in order to analyse for contents and explore trails in the data that might suggest age to be a contributing factor. Participants were recruited across four wards in two different locations of the NHS Lancashire Teaching Hospital Trust.

3.13 Data Analysis

The overall data analysis approach employed throughout this PhD study is termed the "general inductive approach" (Thomas, 2006). The general inductive approach is a pragmatic approach to analysing qualitative data. According to Thomas (2006, p. 238.), this approach to qualitative data analysis is useful when "…there is a need to:

(a) Condense raw textual data into a brief, summary format;
(b) Establish clear links between the evaluation or research objectives and the summary findings derived from the raw data; and
(c) Develop a framework of the underlying structure of experiences or processes that are evident in the raw data."

The general inductive approach is a data analysis strategy that requires a reflexive handling of data in order to allow the most prevalent or dominant themes to emerge from the raw data and coalesce into a formidable body of knowledge. This is a systematic approach of gleaning information and allowing the raw data to address the questions raised in the objectives. While it is commonplace to use some form of software (such as QSR NVIVO) in the analysis of qualitative research data, it is important to divorce the instrument of analysis from the conceptual approach employed in the data analysis. Ritchie and Lewis (2003) urge qualitative researchers not to allow the rigid structures of computer-aided qualitative data analysis software to dictate the data analysis process.

In this PhD study, non-numerical textual data was collected in all of the five phases of data collection illustrated in Figure 3.4. For instance, the analyses of the raw data collected in Phases 1, 2, and 3, were conducted using the general inductive approach. The audio files of the interviews and the focus group were converted into verbatim texts, which were then evaluated in the context of the research questions they were intended to answer. Data collected in Phase 4 under post-occupancy evaluation were large in quantity, however, these were qualitatively analysed. The architectural design features measured with the aid of the WEAT POE checklist were expected to converge into a 'framework' of

PCI scores, which is indicative of the adequacy of the ward elements to support the nursing staff on hospital wards. In Phase 5, data collected in the validation focus group were verified against data collected at the preceding four phases for accuracy and consistency. Embedding reliability and validity in the data analysis stage requires that, for example, an 'independent' colleague to the researcher, undertake the coding of the transcripts. For instance, Barbour (2001) claims that this should form part of the supervisory activity in a postgraduate research study. The multiple coding of the same text by separate researchers attempts to foster convergence or divergence of themes, so that misinterpretation could be resolved earlier before being embedded in the further stages of the research process.

3.14 Data Synthesis

Data collection in this study had been undertaken in five phases (Figure 3.4), from different sets of participants at each phase, and to fulfil different objectives, with each preceding phase potentially informing the next. No doubt this multiple source of data gathering enriches the research project, but it also poses the challenge of interpretation and representation. More importantly, each phase of the data collection is expected to make its own contribution to the attainment of the ultimate goal of the research project. It is therefore imperative to bring together the analysed data in a communicable form. Data synthesis is used to integrate the different themes, concepts or models that have emerged or have been constructed from the raw data, in order to form new knowledge. In so doing, the research process may be 'exposed' to the risk of data misinterpretation and/or misrepresentation. To reduce such risk of fallibility, triangulation is an attempt to substantiate research claims through multiple sources of evidence, because, as observed by Campbell and Fiske (1959), "...for any body of data taken, there is a subinfinity of interpretations possible…" and, also "…any single operation as representative of concept, is equivocal" (p. 101). Triangulation is underscored by the basic principles of geometry, which, according to Jick (1979), improves the accuracy of the research, by "…collecting different kinds of data bearing on the same phenomenon" (pp. 602-611). Employing more than one perspective to exploring and understanding a phenomenon would provide evidence to approve or disapprove the existence of that reality (Thomas, 2016). Yin (2014) suggests a nomenclature of its application, claiming that a researcher may employ four ways to undertaking triangulation in social science research: data triangulation, investigator triangulation, theory triangulation and methodical triangulation. It has been documented that triangulation of research findings does not only serve as corroborative evidence, thereby increasing the quality of the data, but may actually increase the quantity of data collected and, as a result, enrich the knowledge and understanding of the studied phenomenon (Begley, 1996).

Campbell and Fiske (1959) further suggested that the central validity claim a researcher using triangulation could make is that as long as all the multiple approaches are converging at the same evidence, then the research account could be better substantiated. However, some authors argue that even if the evidence converge towards the same thing, there is still no guarantee that all the various approaches were correct (Bloor, 1997). Seale (1999, p. 61.) concludes that "…triangulation, therefore, if used with caution, can enhance the credibility of a research account by providing an additional way of generating evidence in support of key claims. One does not have to regard it as an indefinite process of infinite regress if it is accepted that the sort of knowledge constructed by social researchers is always provisional, but is nevertheless, attempting to convince a sceptical audience." This research study employed the methodical triangulation strategy. Data were collected on the same case through different methods. The case study for the research project is the NHS Lancashire Teaching Hospital Trust. For example, triangulation, as applied in this PhD study was in the form of interrogating managers of NHS about the age-friendliness of their NHS establishment in the exploratory interviews. This was then followed by the exploratory focus group with nurses in general to establish the job demands of nurses. Then investigative interviews of ward nurses was conducted, the accounts of whom were verified by undertaking post-occupancy evaluation surveys of the same NHS hospital wards, where these nurses are located. Finally, a validation of these findings was conducted (see below in section 3.14) to confirm the researcher's understanding and interpretation of the collected data. This methodical approach of triangulation was followed to ensure that, at every stage of the research project, reliability and validity were embedded in the process.

3.15 Result Construction

The fourth and final stage of the research process is the construction of the results. In this case, it is the development of the Nursing Tasks and Environmental Assessment Framework. While a multifarious of complex data had been collected and analysed to achieve this objective, it was important to be able to present and communicate the final outcome to an interested 'layman'. This is not a self-fulfilling exercise, as the stakeholders and beneficiaries of the NTEA Framework must understand its basic parameters and implementation procedures. However, the most important reason to engage participants after the results of the research have been constructed is to validate the 'new knowledge'. For instance, Mays and Pope (1995) noted that respondent validation has been used in previous research within the NHS to corroborate the accounts of doctors, managers and patients in order to establish convergence between the data sources. Mays and Pope (1995, p. 111.) observed: "…validation strategies sometimes used in qualitative research are to feed the findings back to the participants to see if they regard the findings as a reasonable account of their experience, and to use interviews and focus groups with the same people so that their reactions to the evolving analysis become part of the emerging research data." The construction of the results and the validation of those through participants in the study concludes the research process.

3.16 A Reflection on the Research Methodology

At this point it is very important to reflect on the research process and how the research design has evolved. First, this study was originally designed to be a qualitative research, with predetermined linear procedures, with each stage of the data collection process informing the next. However, this approach has proven cumbersome and the need to be reflexive became very obvious. This is most evident in the development of Ward Environment Assessment Tool (WEAT). Firstly, the original research design had anticipated that the 'Person' and the 'Environment' components of the P-E fit would be independently assessed, using pre-existing methods or tools that would be sought from existing literature. This approach has not been feasible. For instance, Objective 5 of this study aimed at determining the functional capacity of ward nurses within the NHS. It became evident that applying existing tools used in the evaluation of functional capacity would not offer a robust result, due to their predominant focus on the measurement of physical abilities. This will be fully explored in Chapter 5 of this thesis. Secondly, the original intention of the research design was to use an existing tool to assess the environment; i.e. the ward elements, which constitute the spaces nurses use for their work. Again, a thorough review of the literature did not offer an adequate environmental assessment instrument that could be used without major adaptation. Therefore, a new tool, WEAT had to be developed to conduct the post-occupancy of the hospital wards. WEAT contains more than 700 architectural design features that could be used to assess hospital wards. This will be explored in detail in Chapter 6. Thirdly, and most importantly, this study was designed to be a qualitative research. The original approach was that only qualitative data would be collected, which would be qualitatively analysed. However, the development of WEAT has added a quantitative dimension to the study, thereby increasing the reliability and validity of the study. Therefore, the original claim to conduct a full qualitative research has resulted in a 'quasi' mixed methods research. This will be fully demonstrated in Chapter 7 of this thesis in which the implementation of WEAT will be presented.

Another important aspect of the research process was that video recording was made of the two focus groups; i.e. the exploratory focus group and the validating focus group. The visual contents of these video recordings were not analysed. Questions could be raised about the need to video record participants, where participant behavioural analysis was not undertaken. There are two reasons for the video recording of the focus group. First, it helped identified which of the participants was talking during the transcription of the audio file. Secondly, and more importantly, during data analysis, watching participants' helped to discern important body language and the group dynamics, which might have been difficult to pick up while facilitating the focus group session. That is why the consenting process described earlier in this chapter is crucial. Participants must be at ease with this approach, so that the information they give during the focus group is genuine.

3.17 Summary of Chapter 3

This chapter presented the methodological approaches employed in the research project, their justification, and how the research design had contributed to the accomplishment of each of the six objectives of the study and the ultimate goal to develop NTEA Framework. The chapter started by exploring the philosophical assumptions of research, consisting of the ontology, epistemology, axiology, methodology and rhetoric assumptions to conducting research. Each of these assumptions was explored, with an explanation of their relevance to the present study. Then a brief introduction of the two main research paradigms frequently applied, were given, i.e., the positivist and the interpretivist paradigms. It was established that this PhD study is situated within interpretivist paradigm, as the research would accommodate the prevalence of multiple realities in the construction of knowledge. In light of this, it was posited that the research study, due to the nature of the research question to be answered, would apply qualitative methodology. The justification for using the case study approach as a means of data collection was given followed by the research design. This chapter concluded by presenting the four stages of the research process, namely the data collection, data analysis, data synthesis and result construction, including the 'technical fixes' employed to embed reliability and validity in every stage of this process. The next chapter will present the first instance of empirical data collection activity in this PhD study, through exploratory interviews with 10 participants, consisting of eight managers and two practising nurses, and then followed by exploratory focus group with six nurses within the NHS.

CHAPTER 4: WORKPLACE EXPLORATORY STUDIES

4.1 Introduction

This chapter presents the results of the first empirical data collection of this PhD study. It is intended to demonstrate how Objective 3 and Objective 4 of the research project have been achieved. As a reminder, Objective 3 was set to identify the characteristics of an age-friendly workplace, by investigating the factors that inhibit or compromise the health and wellbeing of older workers within the NHS. It was expected that this broad understanding would help to further delimit the scope of the study in order to focus on the most crucial issues affecting older nurses within the NHS as a whole. Objective 3 was accomplished by undertaking exploratory interviews with eight NHS managers and two practising nurses. Objective 4 of this project was set to identify the challenging job and environmental demands of nurses within the NHS. To achieve Objective 4, an exploratory focus group study was conducted with six NHS nurses. The results of these exploratory studies are presented in the following sections.

4.2 Exploratory Interviews

The literature review undertaken in Chapter 2 suggested that nursing is one of the most critical professions in the NHS, however it was important to gain an overview of the perception of NHS managers about the research topic as a whole. The exploratory interviews were conducted with eight managers and two practising nurses. This approach was taken to ensure that while high-level managerial views were captured, nurses' opinions were also reflected at this early stage of the study. It is important to note that beyond the primary purpose of the exploratory interviews to identify the characteristics of an age-friendly workplace within the NHS, the exploratory interviews with these managers also served as an introduction of the researcher to the NHS research environment, so as to gain an understanding of NHS research ethics and protocols. In addition, as this was the first instance of empirical data collection from NHS case study sites, certain procedures needed to be followed for the first time.

The main objective of these exploratory interviews was to establish the characteristics of an age-friendly workplace within the NHS. The principal approach to data collection for exploratory interviews is that participants must be mainly in managerial positions, as this stage was designed to capture high level multiple views of participants' understanding of what an age-friendly workplace should be like. As discussed in Chapter 3, while purposive sampling was used to identify and recruit participants for the exploratory interview study, the inclusion criteria was 'convenience'. Nonetheless, the professional profile of participants was defined in advance so that the breadth of management view can be represented in the study. The 10 participants were recruited from human resource management (2), occupational health (2), facilities management (2), practising nurses (2), portering services (1) and hotel services (1). Please see Appendix 4.2 for demographic information about exploratory interview participants.

Participants were grouped according to their profession, and an interview question schedule was prepared for each profession. For example, human resource managers were asked a different series of questions compared to facilities managers. However, as the ultimate goal of this stage of the study is to gain a better understanding of what constitutes an age-friendly work environment, each participant was asked the three core questions designed to explore this issue.

4.2.1 Data Collection

The Facilitator within the NHS arranged interview meetings between the participants and the researcher, so as to ensure only participants that showed prior interest in the study were eventually contacted. All the interviews were conducted at the premises of the NHS LTHTR. On the day of the interview, the researcher visited the NHS premises. Interviews were conducted in an office or a meeting room, away from patients and non-participating NHS members of staff.

An interview record sheet was prepared in advance in which participant responses were recorded. However, each interview was also audio recorded for later transcription and analysis. The central question of these exploratory interviews was to obtain participants view of what an age-friendly work environment was. Three sets of questions were prepared to achieve this purpose. One for the human resource managers (Table 4.1), one for the facilities managers (Table 4.2), and the third for the occupational health advisors (Appendix 4.1). However, irrespective of their professional profile, each participant was asked three distinct questions as follows:

1) How would you describe an age-friendly workplace?

2) How would you describe an inclusive workplace?

3) Would you consider your NHS establishment an age-friendly and inclusive work environment, and if so, how and why?

It is noteworthy that while the first two questions are probing in ‘abstract’, the third question is asking about their specific workplace, and inviting participants to substantiate their suppositions. While the interview subjects are of varying backgrounds, the overriding approach adopted in this exploratory interview study was to ask all the participants the same questions with respect to ‘age-friendly” and ‘inclusive’ workplace, and adapting another series of questions to be more relevant to the position the participant holds within the organisation. Only these first three questions were common for all the groups of professions. By asking each of the group of participants this three set of questions, comparability of opinions was possible across the professions.

TABLE 4.1: Exploratory Interview Question Schedule – Human Resource Managers

	Questions for Human Resource Management
1	How would you describe an age-friendly workplace?
2	How would you describe an inclusive workplace?
3	Would you consider your NHS establishment an age-friendly and inclusive work environment, and if so, how and why?
4	Does your NHS establishment have a policy or guidance to support the recruitment and/or retention of older workers, and if so what are its key aspects? Does this include a clear or explicit guideline to maintain a balance among various age groups?
5	Do you classify jobs based on the physical, cognitive and sensory demands it places on the job incumbent?
6	How would you decide on the appropriate fit between the worker and the job demands, taking into account potential prevalence of limitations to physical, cognitive or sensory capabilities of members of the older worker groups?
7	Do you think that the workplace needs to be adapted to accommodate workers of various physical, cognitive and sensory capabilities? If yes, can you please name any areas that require special attention?
8	Are you aware of any social or behavioural issues caused by the design of work environments within your NHS Establishment?
9	In the last 2 years, have you had any instances when adaptation of the work or the work environment or other issues have required the replacement of a worker (either temporarily or permanently), as a result of age-related health conditions? If so, please explain the circumstances.
10	Are you aware of any job types within the NHS Establishments that are particularly appealing to your older worker groups, and if so why?
11	Are you aware of any job types within the NHS Establishments that are particularly appealing to your older worker groups, and if so why?
12	Do you have any comments on any particular aspects of the workplaces within your NHS Establishment that you think affect older workers?

By differentiating the remaining questions in the schedule according to professional groups, it was possible to obtain a rich data that could illuminate area-specific issues, while also ensuring the main objective of the exploratory interviews was fulfilled; that is, to determine the characteristics of an age-friendly workplace within the NHS.

It is important to note that the occupational health advisors and the practising specialist nurses were asked the same set of questions. This is because the occupational health advisors are also qualified nurses. Likewise, the portering services manager and the hotel services manager were asked the same set of questions as the facilities managers, because portering as well as hotel services are both more concerned with the physical aspects of the hospitals.

TABLE 4.2: Exploratory Interview Question Schedule – Facilities Managers

	Questions for Facilities Management
1	How would you describe an age-friendly workplace?
2	How would you describe an inclusive workplace?
3	Would you consider your NHS establishment an age-friendly and inclusive work environment, and if so, how and why?
4	Do you think that the design of the physical work environment matters and makes a difference to older workers? If yes, in what ways?
5	Do you think that the workplace needs to be adapted to accommodate workers of various physical, cognitive and sensory capabilities? If yes, can you please name any areas that require special attention?
6	In the last 2 years, have you had any instances where adaptation of the work or the work environment or other issues have required the replacement of a worker (either temporarily or permanently), as a result of age-related health conditions? If so, please explain the circumstances.
7	How would you describe your NHS estates from an environmental sustainability perspective (energy consumption, CO_2 emissions, etc.)? Do you grade your NHS Estates and Facilities according to any environmental standards?
8	How do your NHS estates respond to the varying needs of its different occupants with respect to natural lighting, natural ventilation and thermal comfort?
9	Are you aware of any job types within the NHS establishments that are particularly appealing to your older worker groups, and if so why?
10	Are you aware of any best practice workplace design elements within the NHS establishments, and if yes, in what ways are they exemplary? Can you please name these workplaces and the corresponding design elements?
11	Do you have any comments on any particular aspects of the workplaces within your NHS establishment that you think affect older workers?

4.2.2 Data Analysis and Results

All the 10 interviews were later transcribed for analysis. The analysis was manually conducted, although some word search and word frequency search were conducted with the aid of NVIVO 10 for Windows. The 10 participants are coded as PE1 to PE10.

Overall, of the eight managers and two practising nurses interviewed, it is evident that the NHS does not have a policy *per se* that monitors age-related balances in their workforce; it was also revealed that such measures are not warranted. However, the recruitment process, the occupational health pre-checks and other work related risk assessments, suggest the NHS LTHTR is conscious of issues older workers might be facing. As a participant pointed out:

> *"…we don't have a clear or explicit guideline to maintain balance among various age groups, but there is a general strategy around recruitment and retention of older workers is part of that." (PE8).*

However, the comment by PE8 does not mean that measures are not taken on a case-by case basis to make adjustments to job design if required by older members of staff. The following sections summarise participant responses to the first three questions asked across the professions.

4.2.2.1 Age-friendly and Inclusive Workplace

With respect to an age-friendly workplace (Question 1), participants' responses centred around five distinctive themes, namely: retirement, mobility, health, flexibility, and equality. Please see Table 4.3 for the composition of the themes that emerged from the analysis of the explorative interviews. Most of the participants showed great concern for their imminent retirement. While interview subjects are generally apprehensive of their need to work past the SPA, most people do consider the possibility to retire and return to work very appealing, and hence do think an age-friendly workplace should offer them this option. The provision of this option is also seen by participants to be a flexible attribute of an age-friendly workplace. As noted by a manager:

> *"…we actively encourage people to return to the workplace following retirement because we see them as a vital resource in terms of experience…" (PE9)*

Furthermore, flexibility in the form of adjustment to the job content and by offering reduced hours or flexible shift patterns, especially when there seem to be reduction in work ability due to health-related conditions, is also rated highly among participants.

When prompted to describe their understanding of an inclusive workplace (Question 2), the responses given by participants can be grouped into five main themes, namely: accommodating, accessible, health, policy and culture. Please see Table 4.4 for the composition of the themes that emerged from the analysis of participant response to this question. Participants mostly considered that an inclusive workplace would literarily 'involve' employing from the diverse spectrum of society in the workplace or, at least, be representative of the community, which it serves. As observed by a manager:

> *"…we are providing service to a very diverse population, and having a diverse workforce actually helps us in terms of delivering a service to patients, relatives and the community." (PE8).*

Also noteworthy is the importance attached to the recognition of susceptibility of older workers to work-related injury and the ensuing adjustments or redeployment that may be needed to ensure these members of staff are able to maintain their jobs. Participants would like to see their organisation doing more than legally required and have these practices embedded in the policies and culture of the NHS. A participant highlighted:

> *"…I think we are ticking the box for compliance. I think we are ticking the boxes for non-discriminatory…It is going that extra mile, isn't it. What positive policies do we have in place to support people…?" (PE6)*

TABLE 4.3: Question 1: How would you describe an age-friendly workplace?

Themes	*Participants' Responses to Question 1*
Retirement	- Early retirement is ensured - Replacement of older worker after retirement is ensured - Retire and return to work is encouraged
Mobility	- Accounts for slowness as a result of age - Accounts for mobility - Understands the slowness accompanied by age - Takes account of physical problems
Health	- Accounts for health-related issues - Takes into account age and physical & mental capability of workforce - Provides for workers who may have dementia - Colour coordinating design to help people with dementia - Medical issues are accounted for
Flexibility	- Flexible work hours around shifts patterns (reduced hours) - Flexibility is ensured - Makes adjustments in order to retain older workers - Recognising people's needs as they get older - Adaptable workplace - Appropriate adjustments can be made - Capability to perform work is facilitated
Equality (Discrimination & Segregation)	- No preferential treatment - Age does not matter in how employees are treated - No discrimination - No segregation - Positively discriminates towards older people - Managers are sympathetic to age - Recruitment is not based on age - More than complying with legislation - Recognising differences in people's needs due to age - Suits all age cohorts - Age does not matter
Miscellaneous	- Mix of young and older workforce guaranteed - Fit between tasks and age is ensured - Fit for purpose - Has appropriate rest places - Helps maintain dignity - Varying ages are valued - Diversity is respected - Supports an ageing workforce - Accommodating people of older generation

TABLE 4.4: Question 2: How would you describe an inclusive workplace?

Themes	*Participants' Responses to Question 2*
Accommodating	- Takes into account everybody in the workplace - Accommodates different kinds of people - Acknowledges differences in gender, age, etc. - Not discriminatory in terms of age - Takes account of everyone in the population (age, gender, race, etc.) - Diverse workforce - Does not discriminate against age, gender, race, etc.
Accessible	- Suitable for disabled users - Ramps, lifts, etc. are built in - Disability is recognised
Health	- Injury is accounted for through redeployment - Occupational health support is offered in case of sickness absence
Policy	- A good balance between the workforce - Equality principles are embedded in its policies and procedures - Disability Discrimination Act (Equalities Act) is adhered to - Policies in place to help older staff
Culture	- Team working - Team supporting - Having older people in the workforce as positive - Assumes people want to work longer past the State Pension Age - It is part of the organisation's culture - Embedded in organisation communication - Seeking and respecting views in change and decision-making process

4.2.2.2 Age-friendly NHS

The third question (Question 3) was intended to be a reinforcement of the first two, with the focus on the particular NHS workplace of the participants. Participants were invited to give account of how and why they think their NHS establishment was an age-friendly and inclusive workplace. Six of the 10 participants thought that their NHS establishment was an age-friendly and inclusive workplace. Three of them thought it was only partially so, while one participant thought it was neither age-friendly nor inclusive.

TABLE 4.5: Question 3: Would you consider your NHS establishment an age-friendly and inclusive work environment, and if so, why?

Themes	*Participants' Response to Question 3*
Diversity	- Employment of people with various ethnical backgrounds - Diversity is valued - Old and new generation work together
Retirement	- Retire and return as bank staff - Able to retire on health grounds - Subtle pressure sometimes applied to evict workers after State Pension Age is reached - Age of retirement is increasing - Retire and return policy in place - Nurses tend to retire at 50 years after 30 years of service - Retire and return policy facilitated - Workers come back to volunteer after retirement - Retire and return policy ensured
Flexibility	- Flexibility with shifts is ensured - Adjustments to work are made - Gives appropriate support if performance declines - Allows flexible working hours - Caters for the workers' needs - Flexible work patterns (shifts) offered - Managers don't always accommodate 'decline' in capability & performance due to age - Managers can't always make adjustments to work - Work environment is adapted to suit employee - Rigidity versus flexibility is an issue
Training	- Management trained on discrimination - Ward nurse managers still need to be trained in human resource management
Experience	- Experience is valued - Experience is lost in retirement - Experience is a vital resource - Pensioners are used as trainers
Miscellaneous	- Ensures fit between worker and job - Compliance with legislation assured - Car parking for disabled access sometimes offered - Many roles have manual and physical elements - Teamwork is important – helping each other - "This NHS has improved, but things need to get better…" - Inappropriate communication between manager and employees is problem

Unlike the first two questions, participants' responses to this third question were expected to be more judgmental and reflective of the real situation at their workplace from their own view point. Overall, participants commended the organisation for being responsive to age, despite there being no policies that address age *per se*, as indicated earlier. Flexibility and retirement were the most frequently highlighted themes, with both positive and negative attributes.

4.2.2.3 Overarching Themes

After a thorough review of the transcripts, the themes that emerged are presented in this section. Across the three questions, three themes seem to have emerged, indicating issues NHS managers and the practising nurses thought were of major concern to older workers within the NHS. These themes are ‘health’, ‘retirement’ and ‘flexibility’ in the context of the environment of occurrence (Figure 4.1). The three themes were present at least twice across the responses to the three questions.

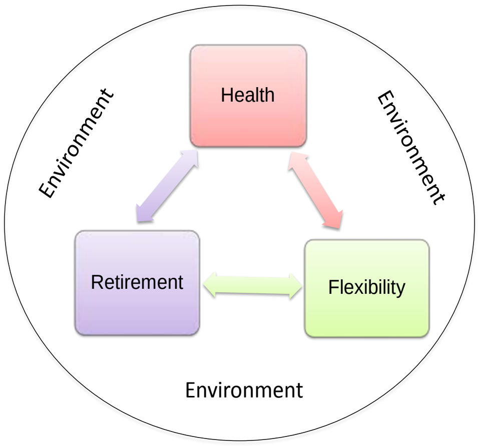


FIGURE 4.1: Overarching Themes of an Age-friendly NHS

A further analysis of the results revealed that while ‘health’ as a theme was prominent in the first two ‘abstract’ questions (1 and 2), it was only ‘vaguely’ mentioned in the more specific Question 3. In other words, while participants emphasized the importance of health in an age-friendly and inclusive workplace in Questions 1 and Question 2, they failed to mention attributes that would have suggested its importance in the more specific Question 3. A plausible explanation for this may be that accessibility to health services *in situ* was ‘taken for granted’ by participants as a whole, because, as a healthcare service provider, it was a ‘given’. For instance, a participant recalled a personal experience as follows:

> *“…I live 15 miles away. Because of the disabilities that I’ve had, I have to attend regular hospital appointments. And I was being made to take annual leave to attend these hospital appointments. Rather than if somebody lives in Preston, they come to this hospital for outpatients, they could just leave the workplace, go to the appointment and come back. I had to take annual leave because of the distance I lived.” (PE1)*

NHS employees in the case study hospital saw health as an important aspect of their work, but access to health services was not necessarily seen as problematic, provided their hospital appointments were at their workplace. The concerns older workers face as represented in these three themes is, and should be, of concern to the NHS management as well.

A further analysis of these NHS age-friendly and inclusive workplace themes, and if put in the context of the literature review, especially, with respect to the P-E fit theory discussed in Chapter 2, suggest that this PhD study may be further pursued in a two-dimension research matrix. The thematic dimension consists of the three themes that have emerged as the characteristics of an age-friendly NHS work environment, namely, health, flexibility and retirement. The second dimension is the personal constructs dimension, which puts these issues in context, by investigating the correlation between the themes and existing theoretical contexts identified under P-E fit (Table 4.6).

TABLE 4.6: Research Matrix and Probable Research Domains

		Personal Constructs				
		PHYSICAL	COGNITIVE	SENSORY	EMOTIONAL	SOCIAL
Age-friendly Characteristics	HEALTH					
	FLEXIBILITY			Probable Research Domains		
	RETIREMENT					

At this stage it is necessary take stock of the empirical data and attempt to compare these findings with existing literature. This is important because the scope of this PhD study has to be delimited with respect to what is feasible to achieve with the available resources and within the timeframe. In the research matrix shown in Table 4.6, while the exploratory interview results have identified these three themes of which older nurses are mostly apprehensive within the NHS, it should be noted that there is a strong argument that health plays a more prominent role in the intention of nurses to remain in the profession or leave. However, a decision must be made at this point as to which of the three issues in the thematic dimension and which of the items in the personal constructs dimension are worth further exploration in this PhD study.

The exploratory interview results imply that the three most important characteristics of an age-friendly and inclusive workplace, within the studied NHS workplace are: (i) Health, (ii) Retirement and (iii) Flexibility. Essentially, this means the workplace must support older workers in these areas, for their employees to see the work environment as age-friendly and inclusive. While these themes should in part form the basis for further investigation, the relatively small sample of 10 participants suggests that caution should be exercised in drawing far-reaching conclusions from these findings. Moreover, as suggested earlier, the purpose of the data collection at this stage was to explore overall NHS management views on the topic, therefore the opinions expressed at this stage is not expected to be representative by any means the view of older nurses. It is, nevertheless, important to note that some of these findings are supported by an existing body of knowledge. For example, the importance of health (Bound et al., 1999); retirement (McNamara and Williamson, 2013) and flexibility (Siegenthaler and Brenner, 2008) to older workers, are largely reverberated in the literature review. Similarly, while some of the constructs identified in Table 4.6 are supported by literature vis-à-vis the physical (Soer et al., 2014), cognitive (Wild-Wall et al., 2009) and social constructs (Thomese and van Groenou, 2005); there is very little in the literature to buttress the prevalence of emotional constructs with respect to older workers. The few studies that discuss the interplay between emotional constructs for older workers and their workplace are largely limited to stress at work (Edwards and Cooper, 1990; Schulz et al., 2011). However, as shown in Section 2.7.2 of Chapter 2, health is a major determinant of nurses' intention to exit or remain in the profession. Therefore, it is worthwhile to pursue this thematic line of inquiry.

Likewise, the prevalence of the five personal constructs and their importance has been discussed in Section 2.7.5 of Chapter 2. For the same reason, it is essential to determine which of the five personal constructs are worth further exploration in the next stages of the study. It is argued by the researcher that three out of the five personal constructs should be explored further in the next stages. These three personal constructs are the physical, cognitive and sensory. While the interplay between nurses' work environment and their social and emotional constructs have been widely researched, exploring the impacts the built environment has on these two constructs is beyond the scope of this PhD study. The main reason for taking this stance is that the experience of the researcher and the expertise of the supervisory team of this PhD study are mainly in the built environment. Assessing the impact the built environment has on the physical, cognitive and sensory constructs of nurses is relatively straightforward, in contrast to exploring the dynamics between the social and emotional constructs and built environment. Therefore furthering this study in an area where the principal investigator is more knowledgeable is more desirable, as this approach can ensure the existing knowledge base can be broadened.

The findings of the exploratory interviews together with the results of the literature review, reinforce earlier suppositions made in Section 2.9 of Chapter 2 that there is a research gap that this PhD study can fill, and thereby make an original contribution to knowledge. In the theoretical context of the P-E fit, the relationship between nurses and the work environment in an NHS setting has not been previously investigated. Using the NHS as a case study offers the potential to make the greatest impact in the UK through this research.

4.3 Exploratory Focus Group

Based on the findings of the exploratory interviews, this PhD project proceeded by undertaking an exploratory focus group with six nurses of the same NHS case study Trust, however with a different set of participants. Progressing the study with the involvement of new participants would further enrich existing empirical data and add rigour to the study. This research seeks to develop the NTEA Framework, by exploring the impacts jobs and environmental demands of the workplace have on older nurses within the NHS, based on the interactions between older nurses and their work environment. While the use of interview to query mainly NHS management was intended to glean an overview of the work environment within the NHS, the exploratory focus group is targeted at the main beneficiaries of the NTEA Framework, i.e. nurses.

The intent of the focus group was to allow for flexibility in the evolution of issues that affect nurses within the NHS, with the possibility to explore topics that may be generated during the focus group discussion. According to Krueger and Casey (2009) focus group discussions are most suitable in an environment where the participants feel comfortable, respected and free to express opinions without being judged. Focus groups promote self-disclosure among participants on a given topic of discussion, by building on group dynamics (Freeman, 2006). It requires a sensitive moderator and, if effectively facilitated, a focus group can generate richer data and gives depth to the understanding of the topic of discussion compared to individual interviews (Kaplowitz and Hoehn, 2001).

Undertaking a focus group as a means of data collection is not an alternative to individual interview or participant observation, as it neither fully delivers the depth offered by the former, nor does it completely replicate the context afforded by the latter (McLafferty, 2004). However, in a focus group study, the combined knowledge of the group is greater than the sum of individual contributions. For instance, in an interview setting, the researcher queries the respondent on a given topic and relies on their openness, knowledge and memory recall of the lived experience. A focus group goes a little further due to the multilateral interaction among participants because participants may question their peers' presumptions and thus further expand the premise of the discussion. In social science research, focus groups are particularly useful in the healthcare sector. For example, focus group discussion has been applied as a means of data collection from practising nurses in nursing homes and home-based care settings (Carlson et al., 2014).

4.3.1 Objectives of Exploratory Focus Study

The overarching aim of this focus group study was to complement the findings of the exploratory interviews by identifying the job and environmental demands for older nurses within the NHS. Furthermore, some of the key findings of the exploratory interviews that are deemed to be of relevance to achieving the ultimate goal of the PhD project were further investigated. Table 4.7 presents the focus group questions. In the focus group the positive and the negative health impacts of the nursing job were explored. In particular, this focus group sought to:

i) Establish the most critical work area within the NHS, posing the greatest challenges to older nurses;
ii) Identify the challenging job and environmental demands of nursing within National Health Service in the Lancashire Teaching Hospitals Trust, as established by the exploratory interviews;

iii) Investigate how these job and environmental demands impact on the personal constructs of nurses within the NHS.

TABLE 4.7: Exploratory Focus Group Question Schedule

	Practising Nurses
1	Please tell us your current position/job title, and your main tasks and responsibilities?
2	How long have you worked for the NHS and how long have you been in your current position?
3	What do you understand by the term an age-friendly workplace?
4	JOB – Positive Elements: What are the five major tasks of your job that have the greatest positive impacts on your health and how?
5	JOB – Negative Elements: What are the five major tasks of your job that have the greatest negative impacts on your health and how?
6	ERGONOMICS: Please name five ergonomic features of your job that have the greatest impact on your health, and in what ways (e.g. application of undue force, monotonous or frequently changing tasks)?
7	DESIGN OF THE PHYSICAL ENVIRONMENT: Please name five design features of your workplace that have the greatest impact on your health, and in what ways (e.g. estates and wards layout, accessibility of work areas, ambient lighting, signage, colour coordination, thermal comfort)?
8	A) PHYSICAL: Do you or any practising nurse above the age of 50 that you know of have any physical limitations (e.g. mobility, posture, dexterity, grip strength)? B) PHYSICAL: How do these physical limitations affect your (or your colleague's) daily routine? Examples?
9	A) COGNITIVE: Do you or any practising nurse above the age of 50 that you know of have any cognitive limitations (e.g. way-finding, memory, concentration)? B) COGNITIVE: How do these cognitive limitations affect your (or your colleague's) daily routine? Examples?
10	A) SENSORY: Do you or any practising nurse above the age of 50 that you know of have any sensory limitations (e.g. visual, auditory)? B) SENSORY: How do these sensory limitations affect your (or your colleague's) daily routine? Examples?
11	A) RETIREMENT: Do you see yourself retiring as a nurse? If yes, why? If no, why? B) RETIREMENT: What age do you think is the most ideal for you to retire?
12	What is your vision for the future of Nursing?
13	What are the major points of this discussion that you wish could be put in action?

4.3.2 Preparing for the Exploratory Focus Group

The topics of discussion for the exploratory focus group were designed based on the results of the exploratory interviews discussed in Section 4.2. The exploratory focus group questions were piloted through an interview that tested its relevance and effectiveness. The participant that volunteered for the pilot is a practising occupational health advisor. This participants was also one of the participants in the exploratory interviews. By engaging one of the participants of the preceding stage (i.e. the exploratory interview) in piloting of focus group questions, potential flaws were eliminated, with respect to relevance and clarity of questions. This occupational health advisor has more than 20 years work experience as a nurse. The participant for the pilot interview suggested minor modifications to the questions before administering, which were applied.

4.3.3 Data Collection

While one of the key areas of investigation in this exploratory focus group study is the impact the work environment has on 'older nurses', participation in the focus group was not restricted by age. The reason for this was twofold. First, participants were asked about both their personal experience and what they have observed happening in their practice. So even if a participant had no personal experience about the question, they were encouraged to share personally observed situations in their work environment. Secondly, it was important to be aware, and reduce the risk, of exclusion of valuable opinions, which may occur if there was an age restriction to participation. All participants for the focus group session were either nurses or senior healthcare assistants. Four nurses and two senior healthcare assistants were recruited for the focus group. On average, the nurses have working experience of more than 10 years. All participants gave their written informed consent to take part in the study and agreed that anonymised quotes may be used from the focus group discussion in order to ensure confidentiality in accordance with data protection protocols. Table 4.8 gives a summary of participants' profiles.

TABLE 4.8: Profile of Exploratory Focus Group Participants

Participants	Job Title	Length of service in NHS (years)	Department	Age Group
PE11	Research nurse	13	Research Trials	Up to 39 years
PE12	Research nurse	13	Research Trials	40 – 44 years
PE13	Senior HCA	6	Ward	Up to 39 years
PE14	Senior HCA	21	Ward	50 – 54 years
PE15	Research nurse	10	Neuroscience and Dementia Research	50 – 54 years
PE16	Research nurse	14	Neuroscience and Dementia Research	45 – 49 years

In order to have a relaxed and conducive environment, the exploratory focus group was conducted on site, at the participants' workplace. A dedicated room was provided for the focus group session, so as to avoid distraction from other members of staff or patients. At the beginning of the session, the researcher ensured that all participants were aware why the exploratory focus group was being undertaken and what the objectives of the particular session were. Before the data collection exercise could commence, the researcher invited all participants to read the participant information sheet. Participants were asked if they had any questions regarding the study. The researcher responded to all questions and ensured participants were at ease with participation in the study. After all issues were resolved, each participant was invited to read and sign a consent form to evidence their voluntary participation in the study. Please see Figure 4.3 for a photograph of exploratory focus group of participants during the session.

To stimulate ideas and encourage participants to start talking, a short video was shown about the topic at the beginning of the session. The video lasted approximately three minutes and was intended to give participants an idea of the demographic situation in the UK, including current discourses on policies and practices with respect to the National Health Service. A PowerPoint presentation was also used to aid and facilitate the discussion. At the beginning of each question, the text would come up on a slide so participants can refer back to it during the discussion. This helped to keep the discussion focussed and on track.

FIGURE 4.2: Exploratory Focus Group Participants

The researcher's work was supported by an assistant, who helped with setting up of the audio and video recording facilities. The assistant also helped to take notes, by writing participant responses on a flip chart as the discussion progressed. However, the assistant did not interfere with the exploratory focus group in any other way. The audio and video were recorded and safely stored in accordance with the University regulations and ethical approval for the study. The audio and video recording were transcribed for analysis.

4.3.4 Data Analysis

The analysis was conducted manually in conjunction with the NVIVO 10 for Windows software. In order to reduce the effects of bias and support the robustness of data analysis, a colleague was asked to code independently and review the transcripts. This person did not take part in the preparation of the focus group questions and was not present at the focus group session.

4.3.5 Results

As suggested earlier, the questions of the focus group were designed to capture participants' opinions and experience about the impact their jobs as a nurse have on their health. While the intention of the focus group was to explore 'health' (as was previously established in the exploratory interview), the questions were actually related to other aspects of the nursing job that may impact on their health. This tactful approach was employed to avoid providing a cue to participants as to what the focus group intended to glean from participants. Nevertheless, health was a recurring theme in the analysis. At the initial stage of coding, the four main themes that were explored in the data analysis were personal constructs, environmental demands, job demands and health. Some of these were subdivided into sub-themes as shown in Figure 4.3.

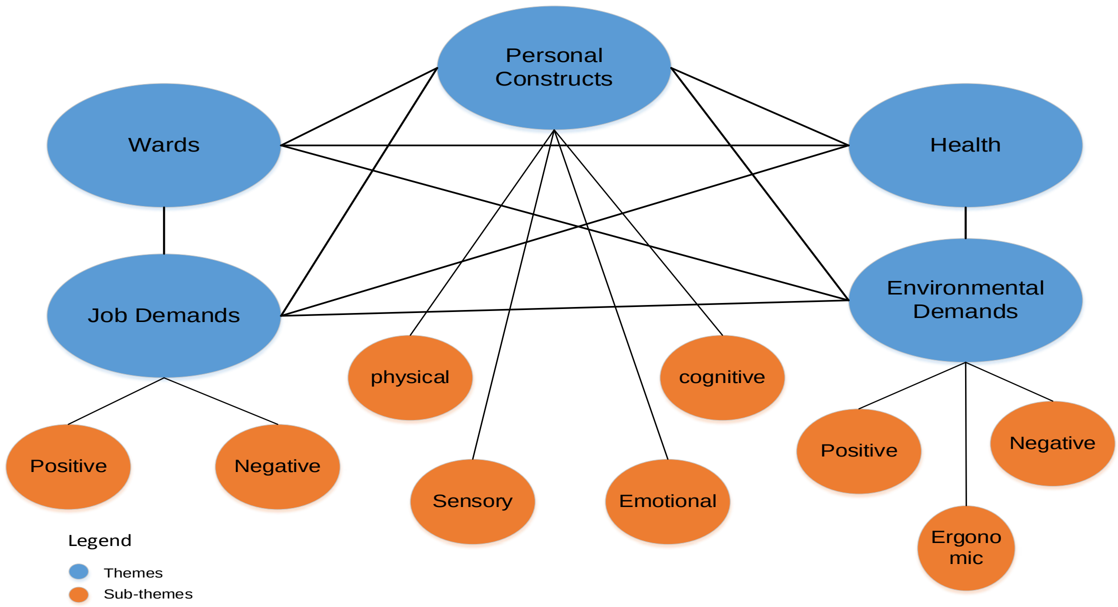


FIGURE 4.3: Exploratory Focus Group Themes and Subthemes

Further into the analysis, 'ward' emerged as an important and a major theme that needed to be explored in greater detail. Ward was then analysed in the context of the other personal constructs, health, job and environmental demands. Furthermore, a summary of the thematic analysis of the exploratory focus group transcripts suggested that the most challenging work area within the NHS for older nurses are the wards. This is a key finding of this stage of the research study, as further data collection must be designed from this perspective.

4.3.5.1 Older Nurses and Ward Work

The most compelling finding of this study is that nurses will not stay in their job as they get older if they had to work on wards. There is a general impression and expectation from colleagues that as you get older a nurse should move on to more sedentary roles. Hence older nurses may be stressed striving to ‘live up to such expectations’, as those that stayed longer on wards are then treated as performing poorly at their job. This is what a participant had to say regarding this:

> *'...The other thing is that people naturally assume, and it does happen and it shouldn't, but if there's an older nurse on the ward who is staff nurse, she's still a staff nurse at that age because she's perhaps not very good at what she's doing. Most people by that age would have moved on...' (PE16).*

This trend seems to be creating a vicious cycle as nurses soon begin to realise that most of their contemporary colleagues have left or are leaving the wards. It is interesting to note that while most of the participants were not themselves working on wards, their opinions about ward work regarding older nurses was unequivocal. The following are the five most frequently cited reasons by participants why older nurses may leave the ward or the profession earlier (Figure 4.5).

Moving and Handling: The dynamic nature of the ward environment is compounded with the physicality of the tasks nurses perform on wards. There is a frequent need to move patients around and, even with the right equipment, a substantial amount of physical effort may be necessary to transfer patients from one functional location to another, e.g. from a wheelchair into a bathtub:

> *'In my particular role there's not as much moving and handling, and heavy work as there would be on the wards... '(PE16).*

The physicality of the ward work is further exacerbated by the fact that with an ageing population, nurses are having to deal with patients that are in worse health conditions on average than it was some years ago. Patients are now almost invariably very poorly, which means they require high level nursing. This has resulted in increased demands on healthcare services and the physical effort required to provide an adequate level of nursing. As suggested by a participant:

> *'...It is hard now because of the nature of the patients coming, they're all really poorly because as soon as they're well enough to be discharged - they're discharged, because the beds are needed so they're all quite poorly. So you have high-level nursing all the time - isn't it? It's more demanding mentally, physically, definitely...'(PE16).*

Nurses having to provide personal care like bathing may have to contend with unhealthy posture, including stretching and reaching. This may increase the risk of sustaining musculoskeletal injuries and may result in sickness absences and, eventually, in premature exit from the profession.

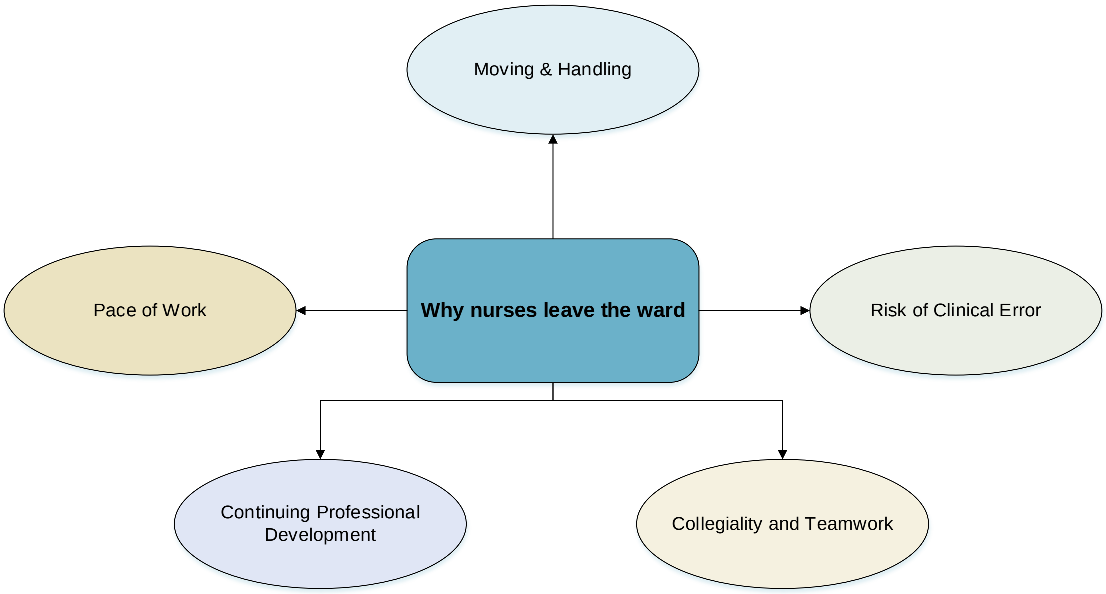


FIGURE 4.4: Why nurses leave the wards

Pace of Work: As nurses get older they may realise that they cannot keep up with the pace on wards anymore, and if they will have to do the same job until their late 60s, then they would rather move on to other less demanding jobs. The ward area is a fast-paced work environment. Even without any form of physical disability older nurses may experience reduced mobility over time, as a natural process of ageing. Reduced mobility in a constantly fast-paced environment may result in lower productivity:

> *'…I think nurses are so used to being independent and healthy and working at such a fast pace. When you know you're not doing that anymore, you start to feel a bit cumbersome in your team and so I think people move on…' (PE16).*

Exposed to an intense pace of work, older nurses may have to make the hard choice between maintaining their independence, and thereby running the risk of reduced productivity and work-related injury; or moving on to less demanding roles within the organisation in order to keep their jobs. However, participants also pointed out that older nurses may be so desperate to keep their jobs, even if by so doing they become a burden to their colleagues. As suggested by a participant:

> *'...I've had a couple of elderly staff as well going back and it was two work ladies that couldn't afford to give up work. So, I had one when I was healthcare assistant and I was on nights. She only worked nights. So, they gave her nights because that was easier for her because there wasn't the hustle and bustle of the ward environment as during the day. However, having her on nights, with it just being the two of you as healthcare assistants was really hard work. Because it was all down to the other person, because..., you know? I am talking (when I was) seventeen years of age on a very heavy ward...' (PE11).*

In a fast-paced ward environment, the need to attend to immediate patient needs may override considerations for personal safety, which may make nurses more prone to work-related injuries (Mark et al., 2007). As a result of this situation, older nurses may soon begin to feel stressed in their roles that they tend to opt out after a while.

Risk of Clinical Error: There is also the tendency that with real or perceived reduced work ability older nurses may constitute a risk factor to patients' health and safety. Older nurses working on wards are therefore also apprehensive of the consequences the demands the ward work would have on their practice. In particular, they are concerned that if they stayed longer on the ward they may face a higher risk of committing a clinical error and consequently losing their licence, due to the job and environmental demands on the wards. A participant noted:

> *'...Worried about my nursing registration. I'd be worried about making a mistake. I think that is probably one of the reasons why a lot of them come off the wards - they're aware that their functioning is slower, so they don't want to be in that situation when something goes wrong...' (PE16).*

For instance, while a significant amount of attention has been given to the risk of physical manhandling of patients, it seems likely that the risk of error in the application of medication is of great concern to practising nurses. Hence rather than wait for the worst to happen, older nurses make a voluntary switch to another role.

Collegiality and Teamwork: Ward work requires a great amount of collegiality and team collaboration. However, nurses that work in shifts tend to work with different colleagues from time to time, which reduces collegiality and team togetherness. The lack of a cohesive atmosphere could mean that workers on the ward may not readily support each other as people working in teams would normally do. A participant not working on ward expressed her views about team collaboration on wards as follows:

> *'...We do (help each other), but that's because we're a close team, we know each other. I don't think you get that support on the ward. You couldn't. It's not the same set of people working together every day. It's literally depending on shift work, isn't it? So, I don't think you get that kind of support...' (PE16).*

Team collaboration, on the other hand, is crucial to the functional management and operation of ward activities. In the absence of a cohesive team, such collaboration may not be readily forthcoming, which may lead to increased workload for older nurses, and thus exposing them to excessive and undue stress (Pisarski and Barbour, 2014). This could then easily translate into premature exit from the profession, or at the very least, moving on to another role.

Continuing Professional Development: In order to ensure that patients are safely treated, nurses must be up-to-date with their professional trainings. However, in a fast-paced ward environment with competing priorities, mandatory training is more likely to be cancelled:

'…I think in this trust, there is a real problem with nurses having their mandatory training. Just because the pressures on the ward is so high that they are not able to release them. Things like manual handling and every nurse should be able to do those sorts of (trainings)...' (PE15).

Even when nurses can make it to the training events, some of these may not be adequately designed, and as such may not be fit for purpose. Participants appreciate the need for training, but noted that these sessions are performed detached from real life situations:

'I don't think the training always reflect working with a real patient. You're working the training on an able-bodied person, and there is a big difference between that and a patient...' (PE15).

Older nurses may therefore still be exposed to the risk of work-related injury, even if they have complied with the requirement to undertake their mandatory training. A nuanced approach to training may be more appropriate for older nurses compared to their younger counterparts; this does not detract from the need to train nurses regardless of age (Pool et al., 2013).

There is an overwhelming concession among participants that the hospital ward, as a work environment, is not very accommodating to older nurses. Participants seem to, invariably, have a negative opinion about ward work, even if they themselves are not working on wards. It was generally acknowledged that the job and environmental demands of nurses working on wards are the most challenging. Participants do not seem to think that there will be too many older nurses left working in the wards, because as nurses age, they tend to move on to less demanding roles within the NHS.

4.3.5.2 Job Demands and Personal Constructs

Ward job demands impact on the various aspects of an older nurse's personal constructs. The impacts the job demands have on older nurses were explored. The three personal constructs investigated were physical, cognitive and sensory. Participants were invited to express their views on any pre-existing physical, cognitive and sensory limitations, and how these may be affecting their daily routines as a nurse.

The negative effects of job demands on wards are most pervasive on the physical constructs. Therefore, it must be appreciated that even with the most appropriate equipment and training, there is an inherent physicality of the tasks that cannot be completely eliminated. This also suggests that there may be a need for nurses to apply undue force while performing their daily duties due to inappropriately designed tasks, or as a result of inadequate equipment. This may mean that older nurses will have to contend with lifting, pulling, pushing and stretching, which may have physical health implications. Nurses may tend to live with physical injury, sustained by working on wards, over their career without any chance of permanent recovery:

'...obviously I am thirty-five and I've been in the job for sixteen years. The damage it's done to me now, I had a bad back when I was eighteen, from working on an orthopaedic ward...' (PE11).

If physical limitations do exist, older nurses may either be restricted in the type of tasks they can perform or they may be more dependent on the support of their colleagues. However, in a ward environment support may not be readily available. Hence, the extent to which the job demands causes physical limitations, may determine if an older nurse decides to remain on the ward or not.

Wards, as a work environment, are busy. Parallel activities may distract older nurses from key tasks requiring intense cognitive resources. The interactions among medical staff and between other healthcare workers and patients in an open bay has an intruding impact on the surrounding environment. However, whereas the existence of physical limitations may be more evident, the prevalence of cognitive limitations may not be readily recognised, even by the affected person. There is an acknowledgement by participants that cognitive acuity of older nurses may diminish with age:

> *'...I don't concentrate as well as I did when I was younger...' (PE16).*

Older nurses may find it harder to stay focussed and concentrate even on tasks requiring a minimum level of cognition. For example, research has shown that time management skills, which is crucial in staff management, is adversely affected by diminishing cognitive resources (Haight and Belwal, 2006). The supposition is supported by a participant's response:

> *'...Certainly it affects time management. So even some simple things like making sure your staff go on break, you know…' (PE12).*

Diminished concentration capability is further exacerbated by shift work, which has proven to be an important factor that impair on older nurses' cognitive work ability (Berger and Hobbs, 2006). Shift work, has a negative impact on sleep patterns. So as people get older, and they tend to sleep less well anyway, any disturbance to their sleep patterns will adversely affect their cognition (Yaffe et al., 2014). Shift work poses a job demand on all healthcare workers, by impeding concentration levels. However, for older nurses working on wards, this problem is attenuated by other job demands like fast-paced workflow.

> *'...I think generally even if they are not over 50, they'll certainly be working shifts. And we are working long days and working nights. You do have certain cognitive limitations, anyway...' (PE12).*

Decline in concentration level will in turn affect certain activities that require a high level of cognitive resources. For instance, it may reduce the ability to make the right judgement on some crucial issues and thus may impede patient safety:

> *'…Maybe allocation of patients, maybe it can affect that, you may be putting a non-supported junior staff member looking after a very sick patient. It is kind of related to that...' (PE12).*

Age, shift work and sleep deprivation do affect ability to concentrate effectively, which has an adverse effect on older nurses' cognition.

While the impacts of ward job demands on the physical and cognitive constructs were widely acknowledged among participants, such relationship were less evident with the sensory constructs. For example, participants were resolute that minor visual impairment may be corrected by prescribed spectacles, hence this will normally not affect older nurses' health or work ability in any adverse way. However, an important intersection between the ward job demands and sensory constructs emphasised by the participants is the effect of ward noise levels on hearing and concentration. This is a crucial problem on a ward, which is de facto a noisy workplace. Even nurses with mild hearing impairment may struggle to cope cognitively in a noisy ward. So an older nurse with poor hearing might struggle to perform their daily duties on a ward:

> *'...No and I think that people with hearing problems, they can't manage when, as you say, there's lots of people talking at the same time, which would happen on the ward...' (PE15).*

4.3.5.3 Environmental Demands and Personal Constructs

It is appreciated that some of the more modern and purpose-built wards will, to a large extent, support older nurses; there seem to be situations whereby the work environment may negatively impact on older nurses' health and wellbeing. In the interaction between older nurses and the work environment an adequate level of harmony is necessary, the absence of which poses an environmental demand on older nurses. Spatial design is one aspect of environmental demand that participants claim has an impact on their health. This has most noticeable impact on the physical constructs, as suggested by a participant:

> *'...Yes. I think that on the wards, they're also-- they're not particularly well designed. Are they? You've got small rooms. So you've got a commode and you've got to get out of this room and through this door, and that's all right when you've got a bit of brute force but I'd say as you get older...' (PE15).*

Some of the rooms in the wards are too small and it is usually too cumbersome to manoeuvre in and out of the rooms with patients. Ill-designed workspace may, among others, lead to MSDs, including lower back pains, and strains in the shoulders and neck (Heiden et al., 2013, Bernal et al., 2015). This opinion was supported by another participant as follows:

> *'...On our ward, I try to get patient out of the bed, there is not enough room sometimes to get over the hoisting or anything and get them out to the chair, without banging into stuff all the time. Even the bathrooms, you can't get in with a patient, and shut the door and come out. They are just not designed right...' (PE13).*

Environmental demands may also impact on cognitive constructs, for example in the form of way finding. This may in turn reduce productivity at work. In a large healthcare estate with widespread and complex layouts, way-finding may prove to be a very frustrating exercise for older nurses. Familiarity with the work environment may partially lessen some of the effects of an ill-designed workspace layout (Wiles et al., 2012), however, older nurses with onset of diminishing cognition may struggle on a daily basis manoeuvring through complex healthcare facilities, as suggested by P15, who is in her fifties:

> *'There're long corridors that look the same so, sometimes you get a bit disorientated about whether you're on your way to X-ray or Pharmacy.' (PE15).*

Even within a relatively small area, nurses cover long distances moving in and around wards. This may be further exacerbated when activities and workflow are disjointed, resulting in physical monotony and/or fatigue.

'So if somebody in Bay One, or whatever, wanted a commode and as a younger person you leg it off to get that but as an old person, you cannot move so quickly and then that patient's going to be wondering where the toilet is.' (PE15).

Moving around the ward area is an inescapable part of a nurse's job. Conversely, the performance of tasks in static postures may equally exert latent force on parts of the body causing injury (Baptiste, 2011). Therefore it is vital that, to the maximum extent possible, nurses' tasks and wards are designed in a way that the interactions between an older nurse and the work environment do not impair their physical health.

Participants are of the opinion that from a physical constructs perspective overall, the design of the wards is not particularly age-friendly, without much regard to older or younger nurses. Participants seem to have an unwavering recognition that younger nurses may be similarly affected by the impacts of these environmental demands:

'...There are young nurses complaining. In a nutshell, I wouldn't be able to run the full length of the ward at 68 years old. That could lead to a cardiac arrest really...' (PE16).

Aside from the physical constructs impacted upon by size and layout of wards, there are other architectural design features that are of concern to participants. There are instances whereby the design of the ward environment may impact adversely on sensory constructs. One such feature is the effect of lighting and balancing between natural and artificial sources of light. Participants are apprehensive that there is no flexibility in allowing natural lights into certain work areas with respect to the needs of patients and employees, so some wards may be permanently blackened out:

'…The whole unit, the critical care unit has some windows, but they are blackened out…, so there is no natural light...' (PE12).

It is appreciated that ensuring patient's privacy and dignity in the healing process should be of key priority; this must be achieved without compromising the health and wellbeing of healthcare workers. Older nurses may be at risk of eyestrain due to inadequate ambient lighting, as they are more likely to have sustained some form of visual impairment, however mild this might be.

Other work environment-related demands like the provision of adequate equipment and tools also have an adverse impact on nurses' health. In particular, the cognitive health of an older nurse may be impaired, as they may be frustrated by broken or malfunctioning equipment:

'…If some of the equipment aren't working, it is essential to patient care, if it is not working…, and again with all the bureaucracy, you go through the whole system to get it reported, to get it repaired. It is quite frustrating trying to report fault or anything...' (PE12).

Older nurses frustrated at their job may be at a higher risk of incurring musculoskeletal discomfort (Habibi et al., 2015).

4.3.6 Concluding Remarks on Exploratory Focus Group Results

There is an indication that participating nurses were satisfied with their jobs. Some participants have been in the practice for more than 10 years. Their commitment to the profession also instigated their desire to ensure the NHS is an age-friendly work environment, as the need for them to work well into their late 60s seems to be quite compelling. This reality was a motivating resource in participants' responses. Participants also draw a parallel between the need to support an older nurse and another colleague with disability.

The most critical work area at the NHS for older nurses are the wards and the two main personal constructs that are affected by both the job and environmental demands are physical and cognitive in nature. While the consequences of a highly demanding job on the physical construct may be apparent and, as a result, more likely to be addressed, evidence of a diminished cognitive construct may not be readily available. The need for drafting and implementation of measures aimed at redesigning the job or the work area in order to buffer decline in cognitive acuity may not be readily recognised, hence such help may not be available. Moreover, it is more likely that affected nurses will compensate for diminished cognitive function with experience and familiarity with the work environment. However, this does not fully mitigate against the risk of clinical error in patient care.

There is an implicit expectation that older nurses should move on from ward areas to other roles over time. When such an expectation become more vivid, it may easily spill over to non-institutional work-related negative discrimination. This sort of latent ageism may cause mental distress among older nurses and may result in them exiting the job earlier than they may otherwise have done. Even if they do not exit the profession or retire outright, older nurses tend to make preparation to leave the ward work area, in order to avoid this psychological pressure. This cause-effect relationship is supported by the literature. For instance, many studies have explored the vulnerability of nurses to burnout as a result of challenging job and environmental demands (Adriaenssens et al., 2015; Duffield et al., 2014; Van Bogaert et al., 2013). Burnout is an important negative predictor of nurses' premature exit from the healthcare sector (Duffield et al., 2014).

The situation on the wards may thus prompt older nurses to want to retire earlier. Nevertheless, those that do stay on the ward and are rewarded with promotion are the younger nurses. So, even if an older nurse stayed on the ward they will most likely be working under the supervision of a younger ward manager or sister. In the past when nurses thought they could retire at 55, then they would stay on the ward, but now as they may have to work until their late 60s, they will move to other positions even before they get to 55, in order to gain the expertise needed in their new role as early as possible. Some of the demands of the job may be alleviated through team collaboration, however, due to the nature of ward work, whereby different set of staff members work in different shifts, the sense of collegiality may be lacking and the chances of getting the support needed for older nurses is reduced.

The findings of this focus group study may be used as evidence-based decision-making for practice and further research. Identifying challenging job and environmental demands for nurses may serve as a preamble to further research that may seek to create a fit between nurses work ability and work environment. There may be a need to introduce job- or task-specific functional capacity for nurses. While adjustments to tasks in order to fit around an older nurse may be necessary from time to time, this may not always be feasible. This also suggests that there may be a requirement to apply differential treatment in determining the functional capacity of nurses in the context of age. The establishment of a nurse's functional capacity should be monitored in order to ensure that this is matched with the job and environmental demands, and a well-timed intervention may be facilitated, if necessary. Indices of a nurse functional capability, plotted against measured job demands and environmental demands will enhance this process. These findings may also inform design decisions of NHS facilities, and therefore preempt the commitment of certain design errors that may adversely affect patients' safety and healthcare employees' health, and be very costly to retrofit.

4.4 Summary of Chapter 4

This chapter has identified the characteristics of an age-friendly workplace within the NHS as a work environment that supports employee's health, is considerate of their impending retirement, and offers flexibility as may be necessary to its employees. Furthermore, the most critical work area for nurses is the ward area. Older nurses are most likely to leave for more sedentary roles or leave the profession altogether, if they had to work on wards. The five challenging job and environmental demands and the five main reasons ward nurses leave the profession prematurely are moving and handling tasks; pace of work; risk of clinical error; lack of collegiality; and the inaccessibility of continuous professional development.

Thus far this PhD study has investigated the experience of nurses using healthcare facilities, through an exploratory focus group. However, it is necessary to gather further empirical evidence on the nuances of the tasks performed by nurses on a typical ward setting, in order to fully appreciate the fit or 'misfit' between older nurses and their work environment. This will be the focus of Chapter 5. Furthermore, the objective characteristics of the workplace have not been assessed. For example, a comprehensive post-occupancy evaluation of the affected NHS premises may help to gain a more concise knowledge of the nature and the dynamics of the interactions between nurses and their work environment. Chapter 6 will seek to devise an objective tool to assess the adequacy of hospital wards to support nursing tasks, while the results of a walkthrough assessment conducted on three of these wards in the case study NHS hospital is presented in Chapter 7.

CHAPTER 5: NURSING TASKS DEMAND

5.1 Introduction

One of the three components of the conceptual framework of this PhD project, is nursing functional capacity. This chapter presents the methodological approach employed in this study to determine nursing functional capacity. In contrast to most mainstream functional capacity evaluation tools currently in use, this PhD study proposes an alternative approach to determining nursing functional capacity. The methodological approach employed in this study is based on the critical evaluation of nursing tasks in a hospital ward setting. To determine the nursing functional capacity in this PhD study, first the nursing tasks in a ward setting are conceptualised as constituting either a direct or an indirect interaction between patients and nurses. Then the empirical evidence from investigative interviews with ward nurses is explored in order to further understand the nursing practice in a ward setting. Due to the challenging job and environmental demands of the nursing profession presented in Chapter 4, there is empirical evidence to suggest that older nurses will tend to move on to more sedentary roles over time. However, if they have to work in hospital wards, the risk of them leaving the profession altogether becomes even higher. It is therefore imperative to delve into the intricacies of the tasks that nurses perform in a hospital ward environment. To achieve this, a theoretical underpinning of nursing tasks was established to be the patient-nurse interaction (PNI). This is then supported by the results of investigative interviews conducted with 20 nursing staff working in the ward environment at the case study hospital. The results of these interviews, synthesised with the theoretical conceptualisation of the ward nursing tasks, helped to illuminate further the demands of the nursing practice discussed in Chapter 4. The ultimate outcome of this stage of the project is the 'Nursing Tasks Demand Matrix' (Table 5.7), which is a comprehensive list of nursing tasks mapped against the domains of the patient-nurse interaction.

5.2 Evaluation of Nursing Functional Capacity

The evaluation of nursing tasks have been of considerable interest to researchers and policymakers in the last few decades in the UK; this renewed interest in better understanding what nurses spend their time on is emerging against the backdrop of an ageing population that is becoming more and more dependent on an efficient healthcare system (Dunnell, 2008). Moreover, the shortage in number of qualified nurses is increasing the demands on the healthcare system. An increasing number of studies have analysed nursing tasks in order to explore nursing contribution to the patient healing process (Swanson and Wojnar, 2004). Sometimes understanding the nature of nursing tasks may help facilitate workload distribution and human resource management on hospital wards (Morris et al., 2007). Other studies have analysed the biomechanical load-bearing demands of nursing tasks (Jang et al., 2007) so as to avoid physical injury such as back strain. Furthermore, there are other analyses of nursing tasks that have focussed on safety aspects of the nursing profession, especially with respect to tasks that require physical interaction with patients, such as moving and handling of patients and medication tasks. Such activities may pose risk of injury for the patient (Vieira and Kumar, 2009) or the nurses themselves (Hye-Knudsen et al., 2004). Also, the coordinating role of nurses in communication with members of the multidisciplinary team is a potential source of risk to patients and nurses. Studies analysing these aspects of the nursing profession are beginning to be more prevalent (Barbetti and Choate, 2003). Collating an inventory of nursing tasks in a ward setting is therefore an important precedence to the development of the Nursing Tasks and Environmental Assessment (NTEA) Framework in this PhD study.

Functional capacity evaluation (FCE) is a tacit gauge for the measure of health and wellbeing, including all the physical, cognitive and emotional characteristics of the person (Soer et al., 2014, p. 1116). FCE is used to assess an individual's ability to perform task activities in a job role. Chan et al. (2000, p. 483), suggested that the assessment of a person's functional capacity should include attributes such as "…physical, mental and social capacities, as well as assessing for the prevalence of any form of disability. On the other hand, Bircher (2005), purports that a person's potential (i.e. the ability of a person to achieve relative and acceptable functional performance) is directly dependent on the demands placed by the environment on that person, and therefore suggests that, for example, reducing the demands on older workers may enhance their functional health, wellbeing and fitness to work. Other studies into the impact the environment has on older people's health suggest that attention to the design of environments that facilitate health "…may either significantly raise the functional competence of the individual or elevate their functioning without altering their basic competence…" (Lawton, 1974, p. 257). Since all forms of human competences diminish with age, Lawton's environmental docility hypothesis recognises the dependency of an older person on environmental circumstances and therefore suggests reducing such environmental barriers in order to 'enable' older people.

FCE is usually referred to in the literature as the evaluation of a person's limitations or capabilities in performing specific tasks in a job role (Baptiste, 2011) in a given work environment. While it is appreciated that personal capabilities and limitations are a function of health, which is given, and cannot be influenced or changed, task activities, on the other hand, may be redesigned in order to accommodate diminished personal capabilities. However, in a real work situation this might not always be feasible. In the nursing profession, for example, there might be stringent medical protocols guiding nursing practice; for example, to conduct vital sign observations at certain intervals or to offer pressure relief to a bedbound patient in a particular manner.

Even after accounting for variations due to specificity of different occupations, a number of concerns have been raised about the reliability and validity of existing FCE tools (James and Schapmire, 2011). For example, the reliance of such tools almost exclusively on the sincerity of the employee being assessed poses the risk of subjectivity. Hence, in a situation whereby a job applicant's interest is to optimise performance, such as in pre-employment screening, the administrator of the FCE procedure may not be able to detect overexertion of physical effort, which undermines the fairness of the individual's real and objective capacity (Lechner, 1998). Conversely, an employee may purposely 'underperform' physical tasks when in a conflict situation with their employer, especially when the cause of work-related injury is the aim of the FCE or when a return to work assessment is being undertaken (Gross and Battié, 2002). Such subjectivity exposes the FCE to criticisms of being an arbitrary evaluation process (Hart et al., 1993). If it is understood and accepted that environmental variables may be objectively measured and would influence physical, cognitive and sensory constructs, then there might be a valid argument for a better representation of environmental variables when conducting an FCE for nurses. However, caution is required in how to determine the most appropriate environmental variables.

While most FCEs have been developed to simulate the real work environment, an employee's real performance in a controlled (experimental) environment might not fully replicate the person's actual potential in real work situations (Isernhagen, 1992). Likewise, even when the work environment have been fully replicated, most existing FCEs lack the rigour to establish unquestionable validity due to the relative short period of time the assessment was undertaken. In an evaluation of FCEs by King et al. (1998), it was found that even the most robust FCE system assessed a work length of five hours. Given that most full-time employment may span over an eight-hour period, the actual function of an individual may not be fully observed in such circumstances. This is even more so for nurses, who are mostly on 12-hour shift rotas. A limitation of extrapolating such results to ward nurse roles in which twelve-hour shifts rotas are not uncommon presents the evaluator with a challenge.

Another frequently cited concern of most mainstream FCEs is their almost exclusive application in the evaluation of workers' physical work ability (Pransky and Dempsey, 2004). FCEs tend to measure work-related functional performance as objectively as practically feasible, based on the individual's physical capability. Other aspects of the job are either neglected outright or ill-defined in most FCE literature. While a person's capability to perform biomechanical tasks may be objectively measured, it is widely acknowledged that the validity of an instrument used for such evaluation may be questionable (Gibson and Strong, 2002, p. 231). For example, in a comprehensive compilation of FCE systems by Gouttebarge et al. (2004), it was shown that the most common feature of their object of measurement is to establish the physical capability of the employee.

Researchers' concern of how far-reaching and objective functional capacity evaluations are also echoed by Lemstra et al. (2004), who argue that the accuracy of FCE measurements depends largely on whether an assessed employee is willing to exert maximal effort during evaluation. It is unclear whether reference to 'maximal effort' here is to physical or other aspects of the task (such as cognitive or sensory). In recognition of the inherent limitations of mainstream FCE, Gibson and Strong (2002) propose placing greater emphasis on the measurement of more subtle psychosocial aspects of the job role, rather than on the biomechanical and physiological domains, especially in assessment of return to work of people with chronic back pain.

Nevertheless, it must be appreciated that the characteristics of tasks an employee performs in a job role influences, to a large extent, the determination of their functional capacity. In the healthcare sector, for example, an FCE in the context of occupational health would place more emphasis on measuring the personal capabilities and limitations of a nurse, which may be given, and dependent on the subject's health status. Furthermore, personal capabilities and limitations may be age-related, and therefore put older nurses in disadvantageous work conditions. A work environment advocating for (age) equality at work may actually be discriminating, if necessary adjustments due to age-related 'limitations' are not implemented. Existing literature of FCE has focused less on the environmental components of functional capacity (Callander et al., 2012). Hence, an FCE conducted in an ill-designed environment may render a worker "functionally unfit", whereas a supporting environment would enable an individual's function in the given environmental setting.

For ward nurses, FCE is primarily dependent on the affordances of the ward environment, which can be construed as the nature of patient-nurse interactions. Unlike most FCEs that attempt to offer an objective evaluation of a person's physical capability, the approach to establishing functional capacity of a ward nurse proposed in this PhD study is that an FCE should be a means to an end, and not an end in itself. Therefore the evaluation of a nurse's fit with their work environment in this study is focussed on the demand attributes of the nursing tasks and how the ward environment may attenuate these demands. Hence, rather than measurement the of an 'ill-defined' physical capability of a nurse per se, for which most FCEs systems are designed, this study proposes the evaluation of nursing tasks in the context of the environment nurses work. Furthermore, health is an 'independent variable' that will be specific to an individual circumstance. Most FCEs indirectly attempt to measure the fitness of the employee in a specific work situation – which is a function of health. This PhD study, on the other hand, is based on the premise that the subject of evaluation is a healthy individual. The question rather is how the work environment support the functioning of a nurse in the given work situation. This presumption is a major difference between the 'FCE' proposed in this study and other mainstream FCEs, which only make an implied reference to the 'non-physical' environment, such as the psychosocial variables of the workplace (Isernhagen, 1992). The difficulty FCE administrators face regarding how to effectively simulate environmental characteristics of the workplace is thus expatiated in this study. In fact FCE in this PhD study is conceptualised as the interplay between the patient and the nurse, which defines the characteristics of the work environment. In this setting, environmental characteristics can be controlled, replicated and thus standardisation of the system can be facilitated, which is a key drawback of most FCEs in use today. Also, in contrast to most FCEs that focus on the measurement of the physical capability of the subject, this PhD study suggests that the cognitive and sensory constructs of the ward nurse should also be considered in as much as the environment influences those constructs. This is of paramount importance due to the complexity of the nursing tasks, which has been shown to span beyond its physicality (Young et al., 2008). There is research evidence that the cognitive demands of modern nursing may be imposing more stressors on nurses than the physical demands of the profession (Potter et al., 2005).

Against this backdrop it should be evident that understanding and determining functional capacity of nurses is more challenging than in most other professions where it is typically applied. This is because the complexity and variety of the tasks nurses perform calls for a more nuanced approach to determine nurses' FCEs. Instead of the measurement of the FCE for nurses, this PhD study suggests the critical evaluation of nursing tasks, based on the direct or indirect relationship nurses build and maintain with the patients in a ward setting. This study takes the stance that the physical environment plays a crucial role in the effective functioning of a ward nurse, and as such, the classical FCE imposes psychological stress on employees, rather than being accommodating, enabling and supporting. Hence this PhD study introduces the Nursing Tasks Demand Matrix (Table 5.7), which is based on the demands the nursing tasks place on nurses based on their interaction with the patients and the patients' environment.

The model of functional capacity proposed in this PhD study is based on the premise that the nucleus of the nursing role on ward is that of supporting patient in the healing process. It is therefore logical to expect all nursing activities and environmental characteristics to be arrayed for this prime purpose. It is the 'responsibility' of the ward environment to facilitate function for nurses, and not vice versa. The Nursing Tasks Demand Matrix is therefore a subject of the interaction between ward nurses and patients (Section 5.3 below), and the extent to which the nursing practice environment is supportive of nursing activities.

5.3 Preparation and Design of Interview Protocol

As discussed in Chapter 3, design of the interview was conducted in several stages. This process was driven by the objective of this stage of the research project, which was to determine the functional capacity of nurses in a hospital ward setting. This section will focus mainly on those parts of the interview objectives that were intended to further illuminate the nursing tasks in a ward setting. The interview question schedule presented in Table 5.1 is a full list of all the questions the participants were asked; however, the core questions that focused on nursing tasks are Questions 6 and 7. Then Questions 8-13 were used to explore the interplay between the personal constructs (presented in Chapter 4) and nursing tasks.

In addition, the results of the exploratory focus group presented in Chapter 4 also informed the preparation of interview questions. According to the exploratory focus group study discussed in Chapter 4, there is a degree of physicality to nursing tasks in ward settings that subjects nurses to unfavourable working conditions. There is a trail of evidence that the job and environmental demands of the nursing profession may tacitly induce nurses to move on to more sedentary roles, if they were to remain in practice. In particular, the most important reasons cited by nurses for not wanting to continue working on wards can be summarised into five broad themes: 1) moving and handling tasks; 2) pace of work; 3) team collaboration; 4) availability and access to training; and 5) risk of committing clinical error. The job and environmental demands of older nurses in a ward work environment is thus manifested in these five critical areas. The interview was used to follow up these five critical aspects of nursing practice. For example, in Table 5.1, questions 14-17; questions 21 and 22 and questions 24-28 were aimed at exploring the results of the focus group in greater detail in order to understand in-depth the nursing practice environment.

The researcher prepared in advance of the interviews a format called the ‘interview record sheet’ (Appendix 5.1) in which the interview responses were recorded. This format contained all 29 questions in the interview question schedule. Participant responses were hand written into this record sheet, important notes were made and this data sheet was used to corroborate the audio files during transcription and data analysis stages. To ensure a comprehensive list of nursing tasks was compiled the Nursing Tasks Data Collection Sheet was prepared in advance of the interviews (Table 5.2). At the end of each interview, participants were given a copy of this sheet to complete in case they remembered more nursing tasks they were not able to recall during the interviews. This additional step ensured that the interview data was further enriched and omissions were minimised as much as practicably possible. The researcher requested nurses to complete the table at their earliest convenience and return them to their ward managers, from whom they were later collected. Please refer to Appendix 5.2 for a sample of completed ‘nursing tasks data collection sheet’. The Facilitator within NHS LTHTR was contacted to help with the recruitment of participants for the investigative interviews. The NHS Facilitator then got in touch with potential ward managers, who in turn informed their ward nurses about the possibility to take part in the study. Interview dates were agreed and those participants that showed interest were sent the letter of invitation (Appendix 5.3) and the participant information sheet (Appendix 5.4). The data collection was conducted in accordance with the University’s ethical approval for the study.

The sampling strategy used for the investigative interviews are purposive sampling by applying ‘deviant’ and ‘particularly typical’ approach (detailed in section 3.11.4) as suggested by Flick (2014), which means, for example, care had been taken to include male nurses, a ‘minority’ cross-section of the nursing population, and also senior healthcare assistants, who perform similar tasks like nurses (apart from medication), but without full nursing qualification. However, it was also necessary that that each participant in this study exhibit the basic characteristics required, which was to be a ward nurse working with patients.

Besides the two pilot interviews conducted with PL1 and PL2 and discussed in Chapter 3, the researcher undertook a total of 21 interviews with ward nurses and senior healthcare assistants at the NHS LTHTR premises in Preston and Chorley. One of the interviews was discarded due to the substandard quality of the data gleaned during the session. However, the 20 remaining interviews generated substantial data rich in quality and quantity and were deemed to have fulfilled the objectives of this stage of the research project. Participants for the main study were coded P1, P2, P3… and P20. Of the twenty respondents, 15 were staff nurses, four were senior healthcare assistants, and one was a ward sister. Furthermore, two of the staff nurses were male, a proportion comparable to the current demographic profile of the NHS workforce. Table 5.3 presents important profile of the participants of the investigative interviews. The main focus of this stage of the study was to seek an in-depth view of the tasks of ward nurses and their work environment, especially nurses dealing with inpatients. However, two outpatient nurses were also recruited and interviewed in order to broaden the data and ensure potential deviant opinions were included. Please see Appendix 5.8 for demographic information about investigative interview participants.

TABLE 5.1: Interview Question Schedule

1	How long have you worked for the NHS and how long have you been in your current position?
2	Do you consider yourself fit and well? Do you feel fit in your work environment as a ward nurse?
3	What type of ward do you work on?
4	How many beds are on the ward?
5	Do you typically work day or night shifts? Percentage split?
6	On a typical shift, please describe the nature of the work of the healthcare team. Please tell us about your role in this team?
7	On a typical shift, please give examples of the tasks you perform and group them in the following categories: i) patient care; ii) patient surveillance; and iii) patient support.*
8	How would you describe the physical demands of the nursing role on the ward?
9	What support or help are at a nurse ward disposal in meeting these physical demands?
10	How would you describe the cognitive demands of the nursing role on the ward?
11	What support or help are at a ward nurse disposal in meeting these cognitive demands?
12	How would you describe the sensory demands of the nursing role on the ward?
13	What support or help are at a ward nurse disposal in meeting these sensory demands?
14	Please name the most frequently performed moving and handling tasks as a ward nurse.
15	Please explain the adequacy of the space, equipment and technique at your disposal to perform these tasks.
16	Do you consider your ward to be a fast-paced work environment? If yes, please name the key tasks of your job that you think require more attention (in time or approach)?
17	How does ward layout affect your ability to move around and perform your duties?
18	Does signage improve your way-finding abilities?
19	Do you think that colour schemes would help in identifying types of spaces and in supporting way-finding in large wards?
20	How do building materials and finishes typically used in wards affect your ability to perform your duties (e.g. do you find shiny surfaces problematic?).
21	How would you describe the noise level in your ward?
22	Does the noise level and/or noise insulation affect your task performance in any way? If yes, please describe.
23	What would you suggest should be changed in the way wards are designed and used?
24	Please describe the major risks associated with the ward nurse role.
25	Please name the key areas of the ward nurse role that you think require special attention in order to avert such risks.
26	Please tell us about any training and other continuous professional development courses you have attended in the last one year.
27	How would you describe the adequacy of the trainings to real life situations?
28	What further training needs would you suggest?
29	Are there any other aspects of your job that we did not cover and you feel are important in supporting your duties?

*These three categories of nursing tasks were explained to each participant during the interview.

TABLE 5.2: Nursing Tasks Data Collection Sheet

Categorisation of nursing tasks

Study title: A Framework for Assessing Nursing Tasks and Environmental Demands

Please give examples of the tasks that ward nurses perform and group them in the following categories**: i) patient care; ii) patient surveillance; and iii) patient support.**

Please read the description of the task groups as follows:

Patient care are tasks performed directly on, and requires interaction with patients, e.g. medication, bathing, feeding, moving and handling, etc. Patient surveillance are tasks that do not require physical contact with patients, but are necessary for patient health, safety and wellbeing, e.g. watching, checking, listening, safeguarding, etc. Patient support are the tasks that you perform away from patients and do not require the presence of patients, but are nevertheless necessary for patient health and wellbeing, e.g. consultation with other social workers and other caregivers, advising and supporting family members, etc.

Name of participant	
Name of Ward/Department (e.g. orthopaedics)	
Date completed	

Please tick the boxes to indicate which groups a task belongs to. If a task belongs to more than one category, please indicate all that is applicable.

List of tasks		Patient-Nurse Interaction (i) Care	(ii) Surveillance	(iii) Support
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

TABLE 5.3: Participant Profile of Investigative Interviews

Participants	Job Title	Length of Service in NHS (years)	Name of Ward	Type of Ward
P1	SHCA	14	Upper Gastrointestinal Surgical	Inpatient
P2	staff nurse	35	Ophthalmology Surgical	Day case
P3	SHCA	2	Upper Gastrointestinal Surgical	Inpatient
P4	staff nurse	23	Upper Gastrointestinal Surgical	Inpatient
P5	SHCA	6	Upper Gastrointestinal Surgical	Inpatient
P6	staff nurse	9	Upper Gastrointestinal Surgical	Inpatient
P7	staff nurse	6	Upper Gastrointestinal Surgical	Inpatient
P8	staff nurse	35	General Surgery	Inpatient
P9	staff nurse	7	Gastroenterology Medical	Inpatient
P10	staff nurse	5	Gastroenterology Medical	Inpatient
P11	staff nurse	10	Gastroenterology Medical	Inpatient
P12	staff nurse	2	Gastroenterology Medical	Inpatient
P13	SHCA	1	Gastroenterology Medical	Inpatient
P14	staff nurse	1	Gastroenterology Medical	Inpatient
P15	staff nurse	2	General Surgery	Inpatient
P16	staff nurse	3	General Surgery	Inpatient
P17	sister	19	General Surgery	Inpatient
P18	staff nurse	18	General Surgery	Inpatient
P19	staff nurse	12	Ophthalmology Surgical	Day case
P20	staff nurse	2	Upper Gastrointestinal Surgical	Inpatient

5.3.1 Data Collection

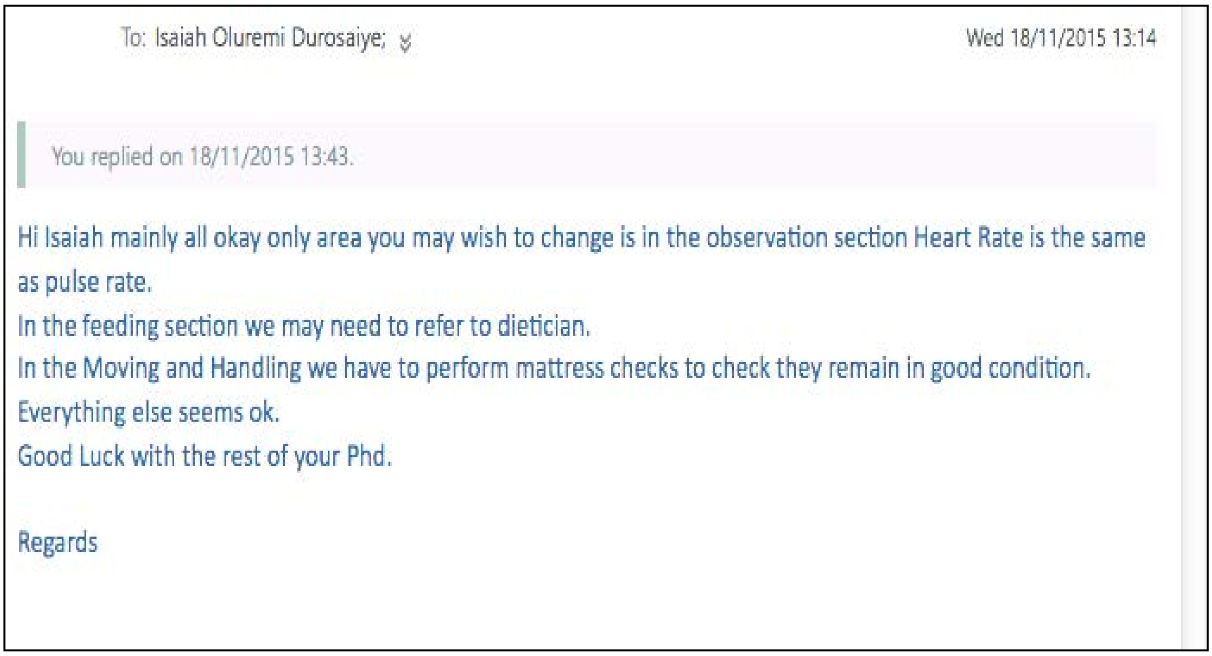
On the agreed days of the interview, the researcher visited the premises of the NHS LTHTR, where all the interviews were conducted. A dedicated room was provided for each interview session in order to avoid distractions and also to ensure that patients and other members of staff were not disturbed by the interview. At the beginning of each interview the researcher briefed each interviewee about the background of the study. In each case, the participant's informed consent was obtained as detailed in section 3.12 of this thesis. The participant information sheet (PIS) that was previously sent through the Facilitator was shown to the interviewee, who were then asked if they had previously read it, if they understood the contents, and whether they had any questions. Participant concerns about the study and the ramifications of their participation were clarified, before each interview session. Then each participant was asked to sign the consent form (Appendix 5.5) to evidence his or her voluntary participation in the study. Information about participant gender and age group was obtained on the 'participant details form' (Appendix 5.6), which participants were asked to fill and sign to prove their voluntary disclosure of such personal details. The investigative interviews were conducted through multiple visits to the selected wards between July and August 2015. Three to four participants were interviewed during each visit and an interview lasted between 45 minutes to 80 minutes. It must be noted that after about 15 interviews the researcher observed that further interviews were not necessarily generating new information. In consultation with the supervisory team, after twenty-one interviews, the researcher decided to suspend the data collection process, with the possibility to return and conduct further interviews, if needed. One of the interview was discarded as it was deemed to be of poor quality.

5.3.2 Data Analysis

An initial scan through the interview data by the researcher revealed that by the tenth interview, new information was not emerging. This realisation was supported by independent coding of the interview transcript by a colleague, who confirmed that after approximately the tenth interview, further review of the data did not generate new information. Therefore, 20 interviews was deemed to have generated sufficient data to reach saturation. The approach to analysing the interview data was predetermined primarily by the overarching goal of this PhD research project and the specific objectives of this stage of the study as outlined in the objectives section of Chapter 1.

Data analysis was supported by the use of NVIVO. First, the twenty audio files were imported into NVIVO. Then each of the twenty audio file interviews was transcribed using the NVIVO software. The analysis of the data was commenced in parallel with transcription. The researcher created an ‘activity log memo’ in NVIVO in which the most important actions taken during the data processing were recorded for future references and possible audit trails. A memorandum was created in NVIVO called ‘memorable quotes’, in which important quotes from participants were temporarily stored for future analysis or annotated for adoption in this research thesis. To ensure data verification and traceability, each quote used in this thesis has been annotated with the participants code, followed by the question to which the response relates and the line in the NVIVO transcript where the quote can be found. This approach has been followed throughout the study in order to add rigour to the data results. For example, a typical quote will be annotated as P5, Q10, L50; meaning the quote is from the participant coded P5, in response to interview question number 10 in the interview schedule (please see Table 5.1), and this quote can be found in line 50 of the relevant transcript in NVIVO text document. Please see Appendix 5.7 for a sample of the transcript. Such annotation provides a clear audit trail for all claims made in the research and ensures future replicability can be independently undertaken (Long and Johnson, 2000). In order to facilitate the data analysis, participants were requested to disclose their age and gender information voluntarily by signing the ‘Participant Details Form’ (Appendix 5.6)

The researcher read and re-read each of the transcripts about three or four times to get familiar with the data. With the aid of NVIVO text search, word frequency searches were conducted to get an idea of the most frequently used words or terms. As the themes of this stage were predetermined, this step was used to explore the prevalence of previously unidentified themes, which might be relevant from the perspective of this research study. These themes were stored and kept for later analysis. Then the purposive search of nursing tasks began, by specifically searching through the data for those task types mentioned by the participants and recorded in the Nursing Tasks Data Collection Sheet (Table 5.2). As each task was identified by searching through the transcripts, it was recorded in a prepared table (replica to the one shown in Table 5.2), until the researcher presumed that the number of tasks had been exhausted. At this point it was observed that the listed tasks could be divided into two categories. Some of the tasks were unique and constitute a single course of uniform action; other tasks could be further divided into subtasks. The singular tasks are termed ‘unilateral’ tasks, while the tasks that could be further divided into subtasks are named multilateral tasks. After a full list of the nursing tasks had been compiled, it was sent by email to one of the ward nurses to check and confirm if the listed tasks were complete or if there were any omissions. The ward nurse highlighted that there were three items that required slight amendments in the compiled tasks list. It was highlighted that heart rate and pulse rate were a measure of the same thing under ‘observation’ (Table 5.5). The researcher had previously listed these two activities separately as subtasks under the task ‘observation’. Furthermore, it was suggested that under the task ‘feeding’, ward nurses might need to consult a dietician to check dietary needs. Then under the ‘moving and handling’ task, the ward nurse highlighted that nurses may need to lift and check mattresses to ensure they were in good working order. Figure 5.1 presents a copy of the email response from the ward nurse in which the suggested amendments were indicated. The information gathered at this point helped to further fine tune the nursing tasks list and ensure that it was as comprehensive as it could possibly be.


To: Isaiah Oluremi Durosaiye; Wed 18/11/2015 13:14

You replied on 18/11/2015 13:43.

Hi Isaiah mainly all okay only area you may wish to change is in the observation section Heart Rate is the same as pulse rate.
In the feeding section we may need to refer to dietician.
In the Moving and Handling we have to perform mattress checks to check they remain in good condition.
Everything else seems ok.
Good Luck with the rest of your Phd.

Regards

FIGURE 5.1: Email Verification of Nursing Tasks by Participant

The next stage of the analysis was to establish the patient-nurse interaction (PNI) domains of both the unilateral and the subtasks of the multilateral tasks. This was done in part by obtaining the information from the table that was completed during the interviews in the transcripts (Appendix 5.2, Question 7). Then the completed Nursing Tasks Data Collection Sheet (Table 5.2) was searched to obtain more information about the tasks and the potential domains. This stage generated a full list of the nursing tasks, divided into multilateral and unilateral tasks, and also completed with their respective PNI domains, i.e. patient care, patient surveillance and patient support. The researcher then decided to verify this list through one of the participants in this study. So the compiled list was sent to PL2, one of the nurses with whom the pilot interview was undertaken, for verification. It is to be noted that this nurse was not a member of staff of the case study NHS Trust. Hence, her judgement and opinion was crucial in establishing not just the completeness of the nursing tasks list, but also in determining which task belonged to which domain. PL2 gave her feedback to the researcher through a telephone conversation. She noted that the nursing tasks list, with the PNI domains was as accurate as it could be at that stage; she however, noted that the task 'psychological support' should be classed as a multilateral type of nursing task; she suggested that offering this kind of support to patients entails doing a number of subtasks that are subset to the main the main task 'psychological support'. PL2 cited important activities and characteristics of this task, such as showing empathy to patient; reassuring patient; 'just being present'; showing a sense of humour; watching the patient's body language; and active listening, as being part of offering patients psychological support. At this point it is paramount to reiterate that this PhD research study is essentially seeking to develop a framework that could create a fit between nurses and their physical work environment. Hence, while it is appreciated that the psychological support nurses offer their patients may be far more complex than presented in this chapter, exploring the interplay between psychological support and the physical environment in a ward setting is beyond the scope of this study. The researcher, therefore, still decided to leave 'psychological support' as a unilateral task because the subtasks proposed by PL2 were too subtle and intangible, and are beyond the remit of the research project. This process identified 23 distinct tasks undertaken by nurses on surgical/medical wards within the NHS LTHTR, including 12 multilateral and 11 unilateral tasks. Each of the 23 tasks is coded as TM, for multilateral and TU, for unilateral tasks, with a double-digit numerical suffix. For example, the task personal care is coded TM05, while the task psychological support is coded TU18 (Table 5.6).

It is noteworthy that the construction of the comprehensive nursing task list is not linear, but iterative as it required revisiting and analysing the data several times before the 'final' nursing tasks list was arrived at, complete with the PNI domains.

5.4 Interview Results

The following sections present the interview results, with respect to the intended objectives of this stage of the research study, which was to establish the functional capacity of ward nurses. First, the result of the investigative interviews established that in a ward setting, the two major factors that affect nursing tasks and practice are age-related, which has been coded here as 'age-factor'. Secondly, nurses must contend with competing priorities of multitasking. Therefore, before discussing the nursing tasks in detail, these two aspects of nursing job highlighted by the participants must first be better understood.

5.4.1 Age factor

As established in the exploratory studies (in Chapter 4), the three main attributes of an age-friendly workplace are health, flexibility and retirement. It was stated that health appeared to be a major predictor of older nurses' intention to remain in employment, hence it was important to further explore if participants' responses were a factor of age and what significance participants attached to age-related attributes of the work environment. It is important to note that none of the questions used in the investigative interview implied that 'age' was a deliberate area of investigation. Therefore participant references to age, gave rigour to the importance of age in the evaluation of nursing tasks in a ward setting. In order to explore the age-factor in participant responses, the researcher coded participants' responses with respect to age. These responses were coded under the theme 'age-factor'. Figure 5.2 is a model of age-factor created from NVIVO. It can be seen that 10 of the 20 participants indicated that age was an important attributes of their work. The prevalence of age in the dataset underlines this model, however, it does not offer full explanation to what interview respondents' perceptions were with regard to age in this context.

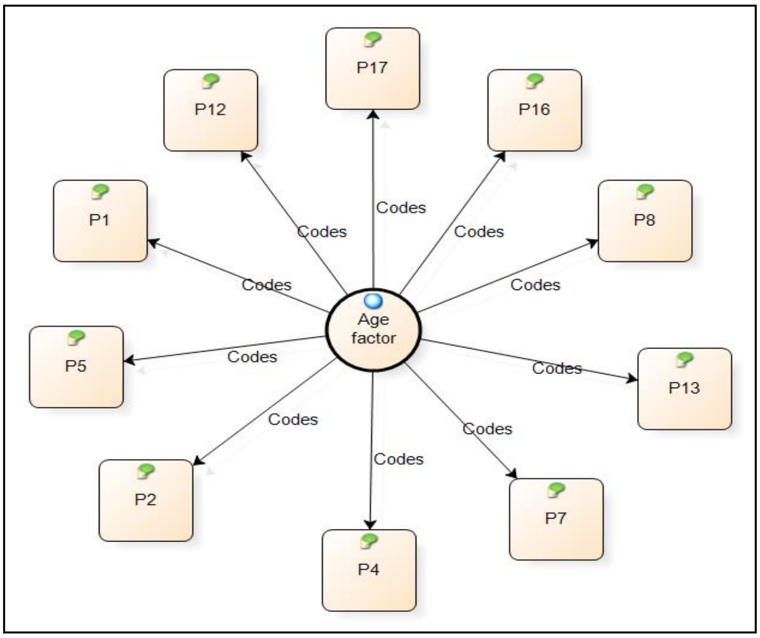


FIGURE 5.2: A Model of Age-factor

An older nurse, as defined by this study, is someone aged 50 years and above; therefore of the twenty participants only 25% (or five) can be classified as an older nurse (Figure 5.3) compared to a total of 50% of the participants that highlighted age-related issues as affecting their nursing practice. This suggests that specifying an age threshold, as selection criteria, was not necessary, and did not detract from the possibility of data shadowing during the investigative interview stage, as indicated in

Chapter 3, to be an important part of the research design strategy. As explained in section 3.11.3, data shadowing in qualitative research means respondents are encouraged to narrate not just their own experience, but to share other contemporary colleagues' experiences in their environment (Morse, 2000).

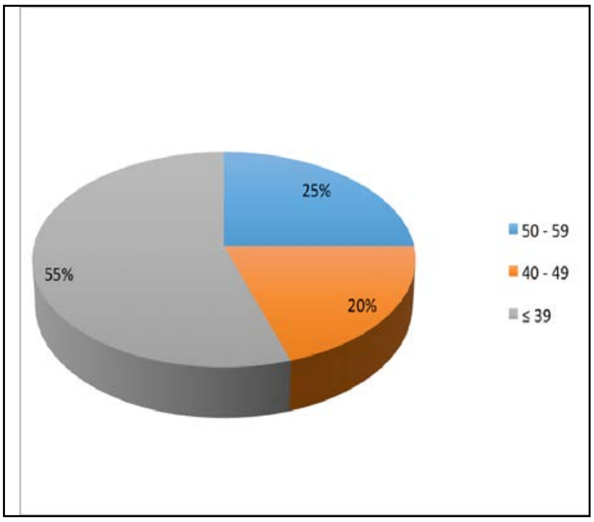


FIGURE 5.3: Participants Age Distribution

In order to establish if age played a role in respondents' references to age factor in the interviews, the data content was explored, based on participants' attributes. Table 5.4 shows the age distribution of respondents to the age-factor. The 10 respondents that made reference to age in the interview were grouped into three categories, namely less than 39 years, between 40 and 49, and between 50 and 59 years. The correlations between participant responses and their age attributes were then explored.

TABLE 5.4: Age Distribution of Respondents to Age-factor

≤ 39 years	40 – 49 years	50 – 59 years
P7	P5	P1
P12	P17	P2
P13		P4
P16		P8

Participant references to age is not just related to 'age' per se; respondents also made reference to other aspects of the nursing job that infer age, such as 'seniority', 'level of experience' or 'length of service with NHS', all of which indirectly imply age. To start with, and in agreement with the results of the exploratory study, empirical accounts show that participants in the age group 50 – 59 years have withdrawn to the cognisance of their imminent retirement. For example, P4, a 57-year old participant noted that:

> *"I can't keep this up when I am in my sixties. And I find it more and more tiring, and I do. There's got to be an end to this. As I am getting older I am getting more forgetful. That could land me in trouble. So I do want there to be an end to it." (P4, Q26, L92)*

In response to the risk posed by the ward work with respect to the physicality of the tasks nurses perform, P1, in her late fifties noted that:

> *"One thing, as I have got older, my wrists and my knees are getting bad, I think with bending…" (P1, Q24, L90)*

This point was supported by participant P2, who had had to move to a less physically demanding job role in the outpatient ophthalmology ward. She claimed that she could not work in a 'normal' ward anymore due to the injury she had sustained on the job.

> *"It is because I have had a problem with my back. I have surgery to my back. So I couldn't work on a normal ward, if that makes sense. Here there is very, very minimal moving and handling of patients. The heaviest sort of moving and handling we do is pushing people in a wheelchair, which if they are not overly large, I can manage. But I couldn't work on a normal ward now. Manually handling patients... I am physically unable. Mentally I could do it. But physically I couldn't do it." (P2, Q2, L8)*

There is however a lot of empathy among older nurses, a majority of whom are experiencing similar job related challenges. Participant P2 further explained:

> *"Very, very occasionally, we'll get to hoist patients. And I have to say the staff on here, because most of us are elderly, and have bad backs. We all have a lot of empathy for each other. So we do support each other. If we have any moving and handling tasks." (P2, Q14, L114)*

Other respondents that made reference to age-factor highlighted the nursing tasks that can be performed based on qualification or experience. For example, P7 noted that the administration of certain types of patient feeding requires the experience of senior nurses:

> *"Like some people have what we call TPN (total parenteral nutrition). This is basically like all the nutrition and things they need go into their veins, through drips. That tends to be more of an evening thing. It tends to be more of a senior nurse that does that, but we need to make sure obviously they are receiving that." (P7, Q7, L25)*

This suggests that demands of management of nursing tasks and workforce, is very much dependent on the overall needs of the patients on the wards, and the lack of an adequately experienced senior nurse may place greater demands on staff nurses on duty. The claim made by participant P7 here also underlines the importance of taking a more nuanced approach to determining nursing functional capacity, as this may be a factor dictated by the level of experience and the seniority of a nurse.

5.4.2 Multi-tasking

There is evidence to suggest that nurses are more than likely to be performing one or more tasks at any given time. As suggested in Chapter 4, the fast pace of ward work is critical for older nurses and the constraints placed by time may require most ward nurses to undertake more than one task at a time in order to ensure they cover as much as possible. Therefore multitasking appears to be an inherent part of the nursing practice environment on hospital wards, as suggested by P2:

> *"You don't have a minute to yourself. Because if you're sat... And sometimes people walk past and you're sat at the computer, you can guarantee you're doing more than one thing. So you might be inputting the patient on the system. And you may also be answering the call on the phone, a triage call. So you can be doing theatre and doing A&E at the same time. So you're never just doing one thing. We are the masters of multi-tasking." (P2, Q16, L132).*

However, empirical evidence gathered during interviews also suggests that not all nurses are able to keep up with the pace of the ward work environment, and they are simply not able to combine multiple tasks, as suggested by participant P4 as follows:

> *"I am a man. I do not multi task. I can only do one thing at a time and people often... you'll be writing something and people are talking in the rear and I cannot do both. I say to people, 'if you want my attention, get my attention'. And I don't mind people prodding me and poking me and saying 'listen to me'. Because, if I am in my zone and I am writing or doing something I am not listening. So I don't multi task. I need to do that one thing at a time. That's the perspective on it." (P4, Q12, L56).*

Ward managers and other stakeholders interested in nursing tasks design and evaluation would then want to consider these circumstances, understanding that while age may play a crucial role in the ability of nurses to perform their tasks, nursing tasks may be designed and adjusted in such a manner that would facilitate the functioning of ward nurses irrespective of age.

5.4.3 Definition of Nursing Tasks

Table 5.5 shows a comprehensive list of nursing tasks in the ward with the number of 'sources', i.e. the number of participants that mentioned the prevalence of those tasks. This information was obtained from NVIVO coding of the transcripts. It can be seen that there is a disparity across the nursing tasks in terms of the number of participants that have mentioned them as being part of the tasks they perform on wards. Some tasks have as few as one person mentioning them such as 'calculate drip rate' under medication, while others were mentioned by virtually all the 20 participants, for example 'documentation'. At this stage the important thing was to ensure all tasks that ward nurses perform are adequately identified, without omissions.

TABLE 5.5: A Comprehensive List of Nursing Tasks and Their Number of Sources

TASKS	SOURCES
Multilateral Tasks:	
Admission	
check for sepsis	2
check medical history	2
general risk assessment	1
Discharge	
advise patient on post operation after care	1
agree discharges with doctors	1

Feeding	
perform drink rounds	2
hand out food to patients	3
feed patients	4
check dietary needs	1
administer PEG feeding	2
administer NG feed	1
administer NJ feeding	1
check & monitor feeding for nil by mouth patients	2
Handover	
discuss patients' cases	3
paperwork	4
walk from patient to patient	3
Info transfer between night and day staff	2
inquire about patient wellbeing	1
compare patient charts with physical observations	1
Liaison	
advise & speak with relatives	7
consult with doctors	16
consult with carers	2
consult with district nurse	4
consult with specialist nurses	4
consult with multidisciplinary teams	5
consult with GP	2
seek Security intervention	8
consult with theatre staff	1
consult with social workers	6
Medication	
affix cannulation	1
affix drips	1
calculate drip rate	1
calculate drug dosage	6
confirm drug allergy	1
perform medication round	10
check control drugs	4
Moving and handling	
walk patient	10
lift mattresses	1
make beds	2
move patient up in bed	7
wheel patient to bathroom	5
restrain patient from falling	1
carry wash bowls	3
roll patient in bed	10
sit patient up in chair	2
transfer patient from bed to chair	6
pressure relief	4
hoist patient	6
move items from around spaces	4
slide patient from bed to another bed	2
assist patient off the floor	3
weigh patient	3
stand patient up from chair	1
move beds around the ward	3

help patient out of bed	2
wheel patient to procedures	2
transfer patient from wheelchair to toilet & vice versa	1
wheel medications trolley	2
move patient in trolley	1
handle ward stocks	1
calm down aggressive & confused patient	4
Specific risk assessment	
perform pressure ulcer RA	4
perform falls RA	7
perform nutritional RA	3
Personal care	
administer drains	2
bed bath patients	4
bed dress patients	2
dress patients	1
wash patients	2
apply anti-embolism stocking	2
perform personal hygiene on patients	6
assist patients toileting	6
perform full body wash on patients	1
administer catheter	5
Post-operation	
perform wound dressing	3
administer pain relief	3
check patient pain score	1
Pre-operation	
complete surgery checklist	1
perform pre-op surgical assessment	1
collect blood from blood bank	2
Observation	
check blood pressures	13
check oxygen saturation	4
check heart rate	1
check respiratory	6
check blood sugar	4
check patient alertness	2
check urine amount	3
check patient pain score	3
check patient for nausea	3
check pressure damage	2
check bowel discharge	2
patient discharge odour	2
take specimens from patient	4
weigh patients	7
measure temperature	8
Unilateral Tasks:	
A&E clinic	2
Telephone	10
Answer patient buzzer	8
Engage & teach student nurses	2
Ward rounds	11
Psychological support	4
Coordination	11

Documentation	20
General risk assessment	12
Watching	18
Walking	16

The next stage of the analysis was to establish a working definition for each of the 23 nursing tasks identified. Table 5.6 presents a brief working definition for each of the nursing tasks. The subtasks under the multilateral tasks do not require further definition, as the name of the subtask item defines the encompassing task activity.

TABLE 5.6: A Brief Definition of each Nursing Task

Task Code	Task Name	Task Description
TM01	Handover	Sharing patient information among nursing staff about patient healing progress. Usually conducted at the beginning of each shift.
TM02	Medication	Preparing and administering patient medication, including dosage measuring and cannula drip calibration.
TM03	Observation	Measuring of vital signs, such as respiratory rate, heart beat rate, blood pressure, and oxygen saturation in the blood.
TM04	Feeding	Feeding and attending to the nutritional needs of patients, including monitoring fluid intake and output and administering alternative feeding procedures, such as nasogastric feeding.
TM05	Personal care	Undertaking and ensuring patients are cleaned, dressed, and well, e.g. washing, toileting and catheterisation.
TM06	Moving and handling	Transferring of patient from one functional position to another position, e.g. bed to chair, repositioning in bed and restraining patient from falling. This task includes non-patient related moving of equipment and other physical activities like lifting, pushing, pulling, reaching and stretching.
TM07	Liaison	Contacting and collaborating with multidisciplinary team members and advising family members and relatives. May include seeking support from GPs, pharmacists, district nurses and social workers.
TM08	Admission	Placement of patient on wards, including bed allocation and check listing of patient for surgical procedure.
TM09	Discharge	Ensuring patient is fit for home, community or other alternative discharge.
TM10	Pre-operation	Preparing patients for surgical operation, e.g. preparing anaesthetic procedures, preparing blood for transfusion and assessing medication requirement pre and post-operation.
TM11	Post-operation	Ensuring patient is recovering post operation, according to appropriate medical protocol, e.g. monitoring and recording vital signs.
TM12	Specific risk assessment	Determining the vulnerability of patients to certain hazards, e.g. risk of falls.
TU13	General risk assessment	General assessment of patient care and needs
TU14	Watching	Safeguarding of patients from physical and psychosocial environmental hazards.

TU15	Documentation	Keeping records of all nursing activities according to the medical/surgical protocol.
TU16	Ward round	Visits at patient bed with doctors/consultants and sharing information to aid patient healing process.
TU17	Coordination	Coordinating own activities with those of other nursing colleagues and multidisciplinary teams.
TU18	Psychological support	Reassuring and comforting patient.
TU19	Walking	Movement within the ward related to attending patient needs
TU20	A&E clinic	Ophthalmological emergency & medical/surgical intervention on patient with eye problems.
TU21	Answer patient buzzer	Attending to patient call raised by call system
TU22	Telephone	Answering ward telephone calls and making telephone contacts to solicit provision for patient support.
TU23	Engage and teach student nurses	Supervising and teaching student nurses

Figures 5.4 and 5.5 show graphical representations of the NVIVO coding of multilateral and unilateral nursing tasks, respectively. The vertical axis depicts the ‘number of references’ a task had, i.e. the number of times it was mentioned by all the participants in the transcripts, according to the coding regime employed by the researcher. This may also be termed as the frequency of occurrence of data. The number of references is plotted against the ‘nursing task’ identified on the horizontal axis.

A multilateral task is an umbrella term for a group of subtasks each intended to result in certain patient outcomes. For example, the multilateral task ‘observation’ consists of a set of subtasks including checking the patient heart rate and taking specimens from patients. While each subtask differs in its constituent activity, the ultimate outcome for both of them is to garner important information about certain physiological bodily functions of the patient. Therefore each of the multilateral tasks depicted in Figure 5.4 constitutes further subtasks, with similar characteristics. Furthermore, it can be seen that within the multilateral tasks, the two main tasks with the highest number of references are personal care and moving and handling related, with 234 and 221 references, respectively. It might be important to further explore the significance and the demands attributes of these tasks, and how the physical environment may support nurses while carrying out these tasks, in the development of the framework.

A unilateral task is a nursing task that constitutes a single body of activity that ward nurses perform for their patients. Such tasks are normally not divisible into subtasks. A unilateral task may constitute a singular complex activity, undertaken over an extended period of time, such as psychological support mentioned earlier. It is noteworthy that of the 23 nursing tasks documentation obtained both the highest number of sources, that is, it was mentioned by all the 20 participants (Table 5.5) and also has 132 references (Figure 5.5); which means it carried the highest frequency of occurrence in the dataset. The strong representation of ‘documentation’ as a nursing task may require further exploration in the construction of the framework.

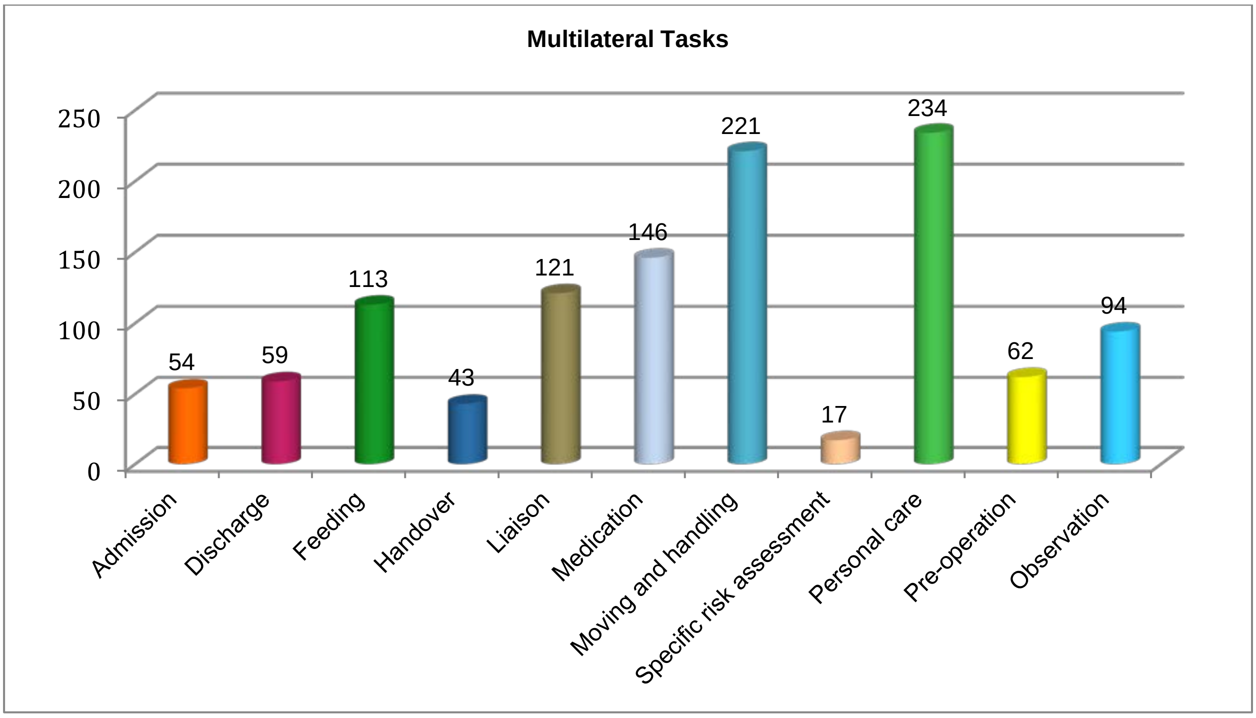


FIGURE 5.4: Coded References of Multilateral Nursing Tasks

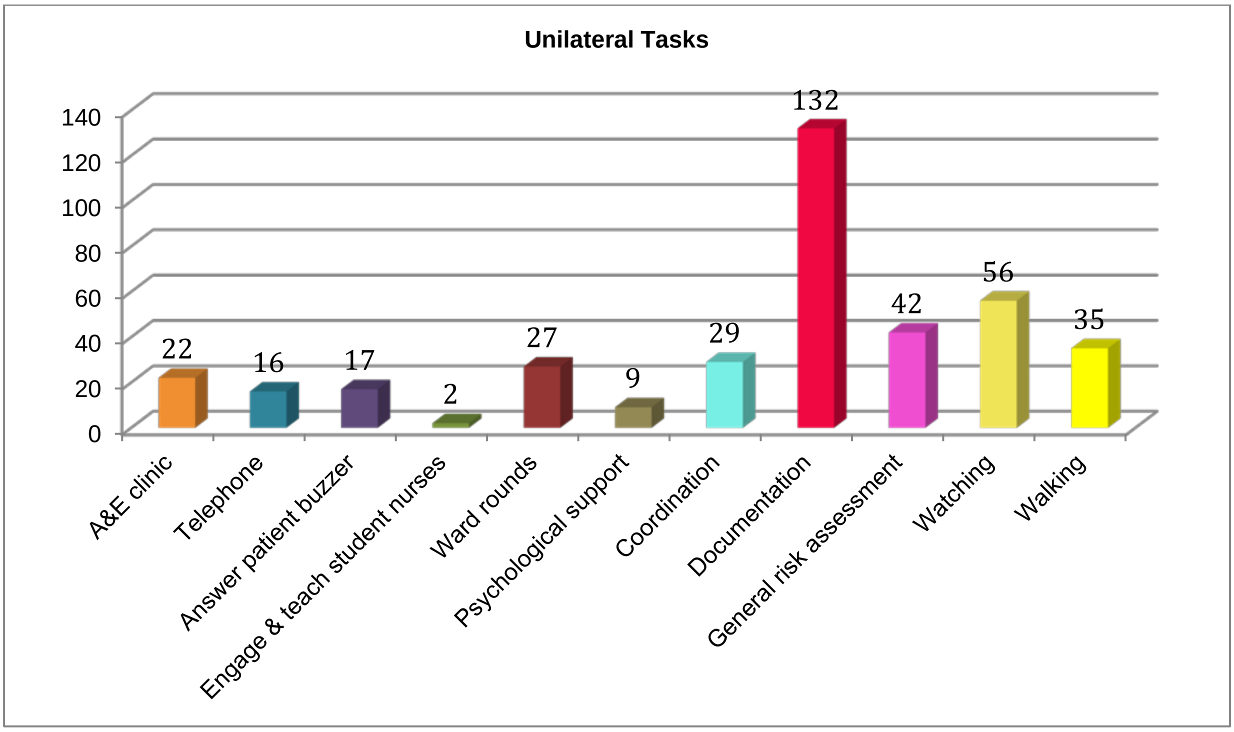


FIGURE 5.5: Coded References of Unilateral Nursing Tasks

As suggested earlier, the higher or lower frequency of a theme's occurrence may be due to the method or approach used in coding of the transcript. Hence, these numbers must be seen in context, bearing in mind the possibility of repetition of a theme by some of the participants, which only increases the quantity, but may not add to the quality, of the information being gleaned. Therefore, when evaluating the nature of the demands of a nursing task, higher frequency of occurrence may suggest the prevalence of a theme, but not necessarily provide sufficient evidence for its importance. On the other hand, a theme mentioned less frequently, might be of great significance to the research study, even though it only has a lower number of references. The objective of the study at this stage was to ascertain prevalence, and not significance, in order to identify and compile a comprehensive list of nursing tasks.

5.4.4 Patient-Nurse Interaction

An effective nursing support for patient healing is underscored by the quantity and quality of the patient-nurse interaction. Hence, defining the characteristics of the demands of this interaction is a prerequisite to undertaking a thorough evaluation of nursing tasks on hospital wards. Also, this evaluation of nursing tasks must be contextualised, as nursing tasks will vary depending on the setting. As established in Chapter 4, nurses working on wards are the ones exposed to the risk of work related injuries and early exit from the profession.

The ultimate functional responsibility of the ward nurse is to support their patients in the healing process by coordinating care and therapeutic activities. All nursing activities are therefore directed at supporting the patient healing process. An analysis of the nursing tasks in a hospital ward must thus be conceptualised as fulfilling or supporting this ethos. However, some authors emphasise the significance of the physicality of the work performed by nurses in this setting (Baptiste, 2011). The importance of the physicality of the nursing job role is underscored by the potential risk of injury to nurses and the concern for patient safety. A number of authors have attempted to illuminate the circumstances under which the physical aspects of the nursing tasks are performed in order to increase safer patient manual handling (Belbeck et al., 2014; Vieira and Kumar, 2009; Skotte et al., 2002). Other studies have shown that redesigning patient handling tasks and/or using assistive devices, such as hoists, promotes patient safety and reduces the risk of injury to nurses (Nelson et al., 2003). However, as most of these assistive devices can only be used in a team, a nurse's dependency on other members of staff to perform seemingly basic tasks may be a source of frustration for the nurse and anxiety for patient.

The physicality of nursing tasks in a ward setting is not limited to lifting and patient moving and handling alone. In a study that investigated how nursing time is spent in a typical 10-hour day shift, it was found that nurses walk as much as 5 miles, with a median distance of 3 miles during the same time period (Hendrich et al., 2008, p. 30). While the physical demands of nursing practice have been widely documented, the complexity of the nursing tasks and the importance of averting risk situations are what define the demands characteristics of the ward nurse role. This is because even simple or less tedious tasks may place high demands on nurses in case of competing priorities, where multi-tasking is a routine. All of these would be compounded by the characteristics of the patient-nurse interaction to constitute the Nursing Tasks Demands Matrix (Table 5.7).

Hence in the context of this PhD study, the functional capability of nurses to effectively perform their duties as ward nurses is conceptualised in the demands qualities of nurses' interaction with patients. The ward nursing job role requires that ward nurses will be in direct or indirect contact with patients in order to support them in their healing process. This support is achieved by performing certain nursing tasks relevant to the individual patient situation. While it must be appreciated that the nursing role is crucial in the patient healing process, a major aspect of the nursing practice is that of coordination. The coordinating aspect of nursing tasks impacts on nurses' personal constructs, depending on the mode and degree of engagement of nurses with patients and other interested parties in the patient's case, such as the multidisciplinary team members and the patients' family.

Studies have shown that ward nurses play a crucial role in the integration of the whole healthcare management process, and also between the various multidisciplinary teams, such as doctors, specialist nurses, occupational therapists, speech therapists and dieticians, in order to ensure continuity of patient care (Aragonès et al., 2008). The quality of the collaboration between doctors and nurses have been found to elicit positive outcomes for patients (Stein et al., 1990; Baggs and Schmitt, 1988). Also, an effective collaboration between nurses and doctors is said to "…enable the knowledge and skills of both professionals to synergistically influence the patient care being provided…" (Vazirani et al., 2005, p. 71). Effective teamwork among healthcare workers has been positively linked to patient safety (Manser, 2009). In particular, a study that investigated the interplay between medication prescription, dispensing and administering and the collaboration between physicians, pharmacists and nurse practitioners, found that good teamwork across these disciplines evoked positive outcomes for patients (Makowsky et al., 2009).

According to Fagermoen (1997), nursing practice is characterised by a patient-nurse relationship in which the patient is vulnerable and extremely dependent on the nurse for maintenance of their basic needs. Depending on the acuity of the patient situation, nurses may have to rely on information from other persons, such as family members, in order to provide the most suitable nursing service to the patient (Hertzberg and Ekman, 2000). The quality of care that a nurse can offer their patient may thus be defined by the quality of the relationship between the nursing staff and family members. For example, Åstedt-Kurki et al. (2001) noted that family members are both informants and recipients of information regarding their relatives in a hospital. Duffy (1988), on the other hand, claims that family members play a crucial role in the health outcomes of the patient in the first instance, and, will most probably be the ones to foster and continue the post-discharge support of the patient healing process.

The early and continuous involvement of family members in the patient healing process is therefore a key element of nursing tasks.

In light of the above, it must thus be appreciated that, beyond their own direct involvement with patients, ward nurses play a pivotal role coordinating and facilitating tasks and contributions of other ‘third parties’ in the interest of their patients. This ‘cardinal’ role of the ward nurse is conceptualised in the context of this PhD study as “Patient-Nurse Interaction” (PNI). Following the trail of thought that the ward nurse’s role is aimed at providing support for the therapeutic healing of patient, three domains of patient-nurse interaction can be identified, namely; (i) patient care, (ii) patient surveillance and (iii) patient support (Figure 5.6). Most of the tasks that ward nurses perform will belong to one or more of these three domains.

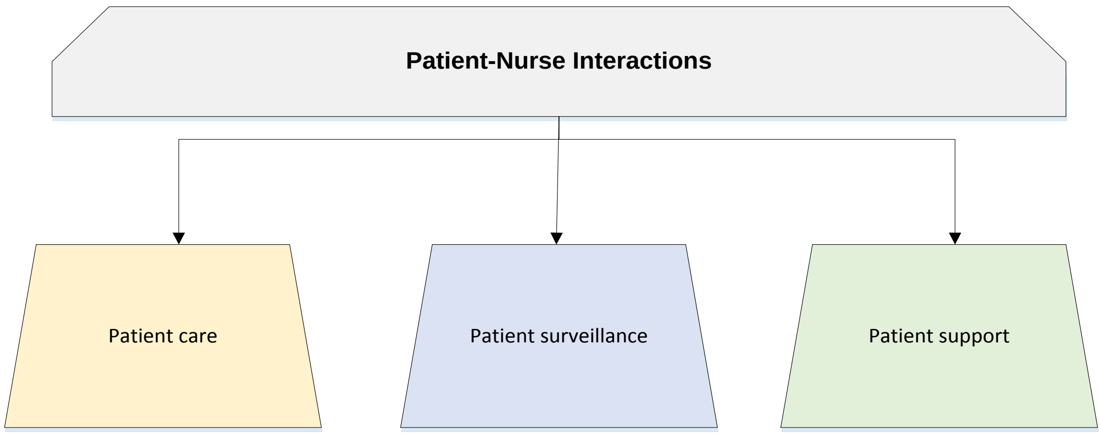


FIGURE 5.6: Nursing Tasks Demand Domains

Firstly, ‘patient care’ are those nursing tasks performed directly on, and requires interaction with, patients, for example, medication, bathing, feeding, moving and handling. These tasks would, mostly, have some degree of physicality to them and they are carried out in direct cooperation with, or implied consent of, the patient (Hendrich et al., 2008). Secondly, ‘patient surveillance’ are those sets of tasks that do not require physical contact with patients, and may not demand the direct interaction with the patient. However these tasks are necessary in order to safeguard patient health, safety and wellbeing, e.g. watching, checking, listening, etc. While these types of tasks do not require ‘active’ physicality, they may evoke a ‘latent’ form of physicality as it may be necessary to perform them in conjunction with other tasks. As a result, it may not be readily evident to an observer that these tasks are being performed (Dendaas, 2011). Thirdly, nurses carry out a number of ‘behind the scene’ activities that are not necessarily visible to a novice ‘outsider’. These are mainly coordinating activities undertaken on behalf of the patient without the presence of the patient. These tasks are termed ‘patient support’; they are performed away from the patients, do not require the presence of patients, but are nevertheless necessary for patient health and wellbeing; for example consultation with social workers and caregivers, advising and supporting family members, etc. (Maxwell et al., 2007).

Nursing tasks are conceptualised as involving some degree of direct or indirect interaction with patients. Therefore, each task will fall into one or more of the three PNI domain categories. The domain categories of each unilateral task and each of the subtasks of the multilateral tasks were established with the aid of NVIVO. During the coding of the transcript texts, each tasks identified was also coded as being patient care, patient surveillance or patient support, as the case may be. During the analysis, a matrix query was conducted in NVIVO to ascertain the intersection between each of the unilateral tasks and the subsets of the multilateral tasks, which are then mapped against the domains of the patient-nurse interaction. Essentially, this approach ensured that the demand attributes of each task was derived from the data based on the coding regime employed and, also based on the completed Nursing Tasks Data Collection Sheet (Table 5.2).

The appropriate cell of Table 5.7 was ticked (✓) if the nursing task was deemed to exhibit the characteristic of the PNI domain, and crossed (✖), if not. The column "SUGGESTED" contains the researcher's understanding of the relationship between the task and the PNI domain. The column "VALIDATED" was left blank, as it was intended that the researcher's results would be validated later during the study (Chapter 8). Most of the tasks that nurses perform will have one or more of the three aforementioned demand attributes of PNI. Therefore, when evaluating nursing tasks, it is important to know which and how many of these attributes a task exhibits, because such understanding will enhance the establishment of the functional capacity of ward nurses relative to the ward work environment. Exploring the interview data and recording the numerical prevalence of participant responses to these attributes helped in achieving this. Furthermore, establishing and understanding the theoretical underpinning of nursing tasks in a ward setting was necessary prior to collection of empirical evidence on the nature of nursing tasks on wards. While some tasks would require more physical effort to perform, such as moving and handling of patients, others may be both physically and cognitively demanding such as performing vital signs observation on a patient. On the other hand, tasks or subtasks such as watching a patient and being vigilant that they are safe, without the nurse having to make physical intervention, may be demanding on the auditory and/or visual senses. Patient-Nurse Interaction (PNI) is therefore being proposed, as an alternative to FCE, which is a qualitative description of nursing tasks in a ward setting. Provided the nursing practice environment is adequately supportive, as will be demonstrated in Chapter 6, a nurse's "Functional Capacity" may be established in this context. A qualitative evaluation of the PNI may provide a better understanding of the nursing tasks, rather than the rigid regime of most FCEs in use today. The validation of the Nursing Tasks Demand Matrix was conducted along with the validation of the NTEA Framework. The full details of the validation process is presented in Section 8.4.2 in Chapter 8.

5.4.5 Nursing Tasks Demand Matrix

The main outcome of this analysis is the Nursing Tasks Demands Matrix (Table 5.7). The Nursing Tasks Demand Matrix is a conceptual compilation and mapping of the unilateral and multilateral nursing tasks with their relevant demand attributes or domains of the PNI. As mentioned in section 5.1, ward nursing tasks have been conceptualised as a series of activities arrayed toward patient healing, and as such may require nurses directly or indirectly interacting or involved with patients and the patients' environment. These demands attributes are classified into three domains namely, patient care, patient surveillance and patient support. The Nursing Tasks Demand Matrix is therefore a comprehensive list of both the multilateral and unilateral tasks ward nurses perform in the course of their duties to support their patients in the healing process.

5.5 Concluding Remarks of Nursing Functional Capacity Evaluation

This chapter has presented an alternative approach to establishing nursing functional capacity in the context of the ward work environment. To achieve this, a critical review of existing mainstream FCEs was undertaken. An analysis of the investigative interviews conducted with ward nurses was used to compile a comprehensive list of nursing tasks, which constitutes two main categories, i.e., multilateral tasks and unilateral tasks. The multilateral tasks consist of task activities that can be further divided into subtasks. The unilateral tasks, on the other hand, are uniform singular tasks, indivisible into subtasks. Based on the understanding that nursing tasks are a series of therapeutic activities designed to effect patient healing through the direct and/or indirect interaction between the patient and the nurse, three nursing tasks demand domains were established that define the characteristics of nursing tasks in a ward environment. Then it was established that the direct and indirect interactions of nurses with patients constitute three types of demand attributes or domains of nursing tasks or subtasks; namely patient care, patient surveillance and patient support. The Nursing Tasks Demand Matrix was constructed by plotting the nursing tasks against the corresponding patient-nurse interaction domain.

The Nursing Tasks Demand Matrix may be used to qualitatively determine the characteristics or demand attributes of nursing tasks in a hospital ward environment by facilities managers, occupational health advisors, ward nurses and other stakeholders interested in the nursing tasks in hospital wards. For example, a better understanding of the nursing tasks may help in the design and management of the physical ward environments by facilities managers. An understanding of the Nursing Tasks Demand Matrix may help occupational health advisors in facilitating readjustment of nursing tasks to suit individual needs of an employee. Human resource managers may use the Nursing Tasks Demand Matrix in drafting nursing job descriptions; while nurse managers may use the matrix to determine task assignment among their staff. It must be noted, however, that the Nursing Tasks Demand Matrix is a precursor to the assessment of the ward environment, as the primary approach to defining functional capacity adopted in this study, is that the environment is either a facilitator or an inhibitor of nurses' abilities to perform their tasks.

It is noteworthy that the construction of the Nursing Tasks Demand Matrix is a precursor to the creation of the NTEA Framework. It is vital the NTDM is only brought to bear on those elements of the physical environment that should support ward nurses in their job role. These will be explored in Chapter 6, as this study attempts to identify the architectural design features of the ward environment, which will then be evaluated in Chapter 7.

TABLE 5.7: Nursing Tasks Demand Matrix

	Nursing Tasks Demand Matrix					
	Task Code	Task Name	Subtasks list	Patient-Nurse Interaction		
				Care	Surveillance	Support
MULTILATERAL TASKS	**TM01**	**Handover**	walk from patient to patient	✓	✓	✓
			discuss each patient case	✓	✓	✓
			info transfer between night and day staff	✓	✓	✓
			inquire about patient wellbeing	✓	✓	✓
			compare patient charts with physical observations	✓	✓	✖
	TM02	**Medication**	affix cannulation	✓	✓	✖
			affix drips	✓	✓	✖
			calculate drip rate	✖	✖	✓
			calculate drug dosage	✖	✖	✓
			confirm drug allergy	✓	✓	✓
			perform medication rounds	✓	✓	✓
			check control drugs	✖	✖	✓
	TM03	**Observation**	check blood pressure	✓	✓	✖
			check heart rate	✓	✓	✖
			check respiration	✓	✓	✖
			measure temperature	✓	✓	✖
			check oxygen saturation	✓	✓	✖
			check blood sugar	✓	✓	✖
			take specimens from patient	✓	✓	✓
			check bowel discharge	✓	✓	✓
			check urine amount	✓	✓	✖
			check patient for nausea	✓	✓	✖

			check patient alertness	✓	✓	✖
			check patient discharge odour	✓	✓	✓
			check patient pain score	✓	✓	✓
			check pressure damage	✓	✓	✖
			weigh patients	✓	✓	✓
	TM04	**Feeding**	perform drink rounds	✓	✓	✖
			hand out food to patients	✓	✓	✖
			feed patients	✓	✓	✓
			administer PEG feeding	✓	✓	✓
			check dietary needs	✓	✓	✓
			administer NG feeding	✓	✓	✓
			administer NJ feeding	✓	✓	✓
			check and monitor feeding for nil by mouth patients	✓	✓	✓
	TM05	**Personal Care**	bed bath patients	✓	✓	✖
			bed dress patients	✓	✓	✖
			wash patients	✓	✓	✖
			administer drains	✓	✓	✓
			dress patients	✓	✓	✖
			apply anti-embolism stocking	✓	✓	✖
			perform personal hygiene on patients	✓	✓	✖
			assist patients toileting	✓	✓	✖
			perform full body wash for patients	✓	✓	✖
			catheter care	✓	✓	✖
	TM06	**Moving & Handling**	patient pressure relief	✓	✓	✖
			move patient up the bed	✓	✓	✖
			transfer patient from bed to wheelchair/chair	✓	✓	✖
			sit patient up in chair	✓	✓	✖

			stand patient up from chair	✓	✓	✖
			slide patient from bed to another bed	✓	✓	✖
			walk patient	✓	✓	✖
			make patient bed	✓	✓	✖
			hoist patients from chair to bed and vice versa	✓	✓	✖
			lift mattresses	✖	✖	✓
			assist patient off the floor	✓	✓	✖
			wheel patient to procedures	✓	✓	✓
			weigh patient	✓	✓	✓
			move beds around the ward	✓	✓	✓
			handle and put away ward stocks	✖	✖	✓
			help patient out of bed	✓	✓	✖
			restrain patient from falling	✓	✓	✖
			roll patient in bed	✓	✓	✖
			move items around bed spaces	✓	✓	✖
			wheel medications trolley	✖	✖	✓
			move patient on trolley	✓	✓	✖
			transfer patient from wheelchair to toilet & vice versa	✓	✓	✖
			wheel patients to bathroom	✓	✓	✖
			carry and empty washbowls of water	✓	✓	✖
			calm down agitated/aggressive patients	✓	✓	✖
	TM07	**Liaison**	advise & speak with relatives	✓	✓	✓
			consult with doctors	✖	✖	✓
			consult with theatre staff	✖	✖	✓
			consult with carers	✖	✖	✓
			consult with social workers	✖	✖	✓
			consult with district nurse	✖	✖	✓

			consult with specialist nurses	✖	✖	✓
			consult with multidisciplinary teams	✖	✖	✓
			consult with GP	✖	✖	✓
			seek Security intervention	✓	✓	✓
	TM08	**Admission**	check for sepsis	✓	✓	✖
			check medical history	✓	✓	✓
	TM09	**Discharge**	agree discharges with doctors	✓	✓	✓
			advise patient on post operation after care	✓	✓	✓
	TM10	**Pre-operation**	perform pre-op surgical assessment	✓	✓	✖
			complete surgery checklist	✓	✓	✖
			collect blood from blood bank	✖	✓	✖
	TM11	**Post-operation**	perform wound dressing	✓	✓	✖
			check patient pain score	✓	✓	✖
			administer pain relief	✓	✓	✖
	TM12	**Specific Risk Assessments**	perform falls RA	✓	✓	✓
			perform nutritional RA	✓	✓	✓
			perform pressure ulcer RA	✓	✓	✖
UNILATERAL TASKS	**TU13**	**General Risk Assessment**		✓	✓	✓
	TU14	**Watching**		✖	✓	✖
	TU15	**Documentation**		✖	✓	✓
	TU16	**Ward Rounds**		✓	✓	✓
	TU17	**Coordination**		✓	✓	✓
	TU18	**Psychological Support**		✓	✓	✓
	TU19	**Walking**		✓	✓	✖

	TU20	**A&E Clinic**		✖	✖	✓
	TU21	**Answer Patient Buzzer**		✓	✓	✖
	TU22	**Telephone**		✖	✓	✓
	TU23	**Engage & Teach Student Nurses**		✓	✓	✓

5.6 Summary of Chapter 5

The fifth objective of this PhD study is to determine the Nursing Functional Capacity Evaluation (FCE). The definition of Nursing FCE is also part of the three components of the conceptual framework. In this chapter, Nursing FCE has been conceptualised as a function of the patient–nurse interaction (PNI). The PNI, in turn was proposed to have three domains, based on the nature of the interplay between nurse and patient. These three domains are patient care, patient surveillance and patient support. Accordingly, it was established that due to the complexity of the nursing profession, the conventional approach to FCE is not very applicable for this study, as this is biased towards the assessment of physical abilities. As demonstrated in Chapter 2 and Chapter 4, there are at least three personal constructs of nurses impacted upon by the physical work environment, namely the physical, cognitive and the sensory. Therefore a more nuanced approach to determining Nursing FCE is to put it in the context of the P-E fit. This means that in an enabling ward environment, facilitated through design, nurses would be able to functionally perform better than in an ill-designed work environment. This concept defies conventional approaches to functional capacity evaluation; however, it offers a more comprehensive method to establishing a fit between nurse's functional capacity and the work environment.

CHAPTER 6: WARD ENVIRONMENT ASSESSMENT

6.1 Introduction

This chapter discusses the rationale for a new ward environment assessment instrument; explores the theoretical underpinning of Post-Occupancy Evaluation (POE), as a methodical approach to assessing the built environment; and critically reviews five instruments used in the assessment of healthcare facilities and which may be adopted or adapted in this PhD study. Furthermore, a simple configuration of a hospital ward is presented and, finally, the four personal constructs to be investigated by the new assessment tool are discussed in depth. The newly developed instrument is called the Ward Environmental Assessment Tool (WEAT). WEAT is a tool that has been developed by this study to assess the performance of hospital wards and evaluate to what extent the characteristics and the architectural design features of the ward elements support the nursing tasks identified in Chapter 5. It must be noted that WEAT is not intended to be used as a set of design guidelines, but rather as a diagnostic tool to aid the evaluation of the suitability of the ward environment for nurses and nursing tasks. The underlying principle adopted in the development of WEAT is that it must assess the functional fit of the physical attributes of the built environment, taking into account the special purpose, for which hospital wards are designed and built.

6.2 Rationale for a Ward Environment Assessment Tool

The demands of the nursing job role and the individual and societal consequences of any laxity in meeting these demands calls for a more holistic approach to understanding the characteristics of the nursing practice environment and how these may be objectively measured against predetermined criteria. However, due to the complexity and the costs of managing a functional healthcare system, authorities are slow to commit scarce resources into evaluating the performance of the nursing practice environment. In the United States, for example, the study of nursing practice environment only became a focal point of interest due to two national health crises arising from nursing shortages and patient safety (Andersson, 2011, p. 182). The enquiry by Robert Francis QC, into the case of Mid Staffordshire NHS Foundation Trust (Francis, 2013), presented in Chapter 1 concluded that patients were failed by a system which ignored the warning signs of poor care and put corporate self-interest and cost control ahead of patients and their safety.

Despite these recent trends, there is still a dearth of tools that have been developed to assess the characteristics of hospital ward environments, which constitutes a workplace for older nurses. The primary function of a hospital ward is to provide an environment that facilitates the healing and recovering of patients in a safe and timely manner (Osmond, 1957). The physical features of the ward environment play a crucial role in this healing process (Abbas and Ghazali, 2012). Also, nurses assume a pivotal role coordinating the activities of the whole medical team in the delivery of patient care in the hospital. While the impacts of the physical attributes of the ward environment on patient recovery have been widely researched, the contributions these make in supporting ward nurses in their duties have received little research attention. There is research evidence that a well-designed and well-laid out ward environment contributes to both patient welfare and better staff performance (Barnes, 2007). However, the cause-effect relationship is arguably inconclusive (HSE, 1992a).

As discussed in Chapter 2, under person–environment fit theory (Edwards et al., 1998), it has long been established that there is a correlation between the affordances of the built environment and the functional capacity of the person situated in that environment (Tinker, 1997). Furthermore, numerous studies have attempted to explain the resultant benefits of an enabling built environment (Iwarsson et al., 2007). In particular, some studies have reported the relationship between the quality of the built environment and the behaviour of its users in a healthcare setting (Bowie and Mountain, 1997). Common to all these studies is the claim that the demands of an ageing population necessitate better understanding of the characteristics of the care environment, especially in an institutional setting. Hence, most of the available environmental assessment tools in the nursing and healthcare setting are aimed at assessing the adequacy of the physical environment for older patients or service users (Douglas and Douglas, 2005); with little or no attention on the nursing staff charged with the responsibility of facilitating the use of these healthcare facilities for the treatment or support of the patients and/or service users. This trend is not newfound. For instance, in the UK the last five decades have seen a lot of advances made to improve the quality of care for older people in an institutional setting by enhancing the positive characteristics of the care environment (Bowie and Mountain, 1997).

One of the major factors contributing to what Barton (2013) termed “institutional neurosis” in persons with cognitive limitations was the “ward atmosphere” (p. 19). The “ward atmosphere” includes attributes of the ward like: colours of walls, ceilings, floors and carpets; space, arrangement of furniture, etc.; ambient noise; smell; and temperature on the wards. Barton (2013) reiterated that assumptions that persons with cognitive impairment are oblivious of these factors, and therefore, environmental affordances do not make much of a difference to their wellbeing should be discarded. Concomitantly, Barton (2013) suggests that the provision of a homely, friendly, permissive ward atmosphere is one of the many ways to treat institutional neurosis. Such an atmosphere would account for individual needs, capabilities, traits, expectations, and choices. Therefore, in order to meet the requirements of a diverse group of users, it is important to understand what characteristics of the environment contribute to user experiences, in what ways and to what extent, and what are the other probable conjugating variables that need controlling or discarding in this interplay. Environmental assessment is thus vital because the variables of the environment, such as size, shape and interspatial relationships, are easier to assess and alter through design than are personal variables like health and cognition (Carp, 1994).

Forsberg and von Malmborg (2004) suggest that to determine if a building actually fulfils the purpose for which it was built, the assessment may be conducted by using two types of methods. In the quantitative methods of building assessment, an audit on the building is undertaken by measuring quantitative data such as materials and energy usage. Qualitative methods of building assessment, on the other hand, are conducted by investigating certain predetermined parameters of the building and establishing an aggregate score for the building. Historically, when a quantitative audit is conducted on a building, information obtained on the building is related to energy efficiency, water usage, indoor air quality, thermal comfort, sound insulation, and lighting. However, in the last couple of decades, there is a growing body of literature that suggest that, while using numerical data to assess and understand the performance of a building is beneficial, this approach should be complemented by involving the users of buildings in the assessment procedure (Enright, 2002). A well-established method of assessing the performance of a building through querying its users is called Post-Occupancy Evaluation (POE).

6.3 Defining Post-Occupancy Evaluation

This first stage in the development of the Ward Environment Assessment Tool is the in-depth review of the use of POE in the UK. POE was first introduced in the United States to appraise the performance of buildings after they have been handed over and while occupied. POE has been fundamentally described as "…any and all activities that originate out of an interest in learning how a building performs once it is built, including whether and how well it has met expectations and how satisfied building users are with the environment that has been created" (Federal Facilities Council, 2002, p. v). According to Preiser (1995, p. 19) POE is a process of "…systematically comparing actual building performance, with explicitly stated performance criteria." Traditionally, POE has been used to establish user satisfaction; alongside the building meeting other preset technical criteria. Clements-Croome (2013) defines POE "…as the examination of the effectiveness of the design environment for human users." In a later study, Preiser (2001) proposed that the evaluation of building performance may be undertaken quantitatively or qualitatively. He acknowledged that most of the performance indicators of a building are quantifiable, such as lighting, temperature, acoustics and humidity. Preiser contends that while a building may show a set of excellent indicators in the quantifiable domain, its occupants may still not be entirely comfortable and satisfied using it. POE has therefore developed to be a methodological approach that can be used to examine the performance of a building by focusing on user satisfaction and identifying "…ways to improve building design, performance and fitness for purpose, through the systematic evaluation of the buildings in use, from the perspective of the people who use them" (Turpin-Brooks and Viccars, 2006, p. 178).

Apart from the overarching goal of delivering user satisfaction, there is an array of objectives for which POEs are commissioned, and quite a few approaches or methodologies by which they may be accomplished. The Federal Facilities Council (2002) identified three different types of POEs, namely indicative, investigative and diagnostic. According to the Federal Facilities Council, the types of POE are descriptive of the purpose for which they are commissioned.

i) An indicative POE is said to give an indication of the strengths and weaknesses of the building. This kind of POE is conducted by interviewing users most conversant with the buildings (space), combined with a walkthrough observation of the facility. The intended outcome of an indicative POE is to create an awareness of issues in building performance.

ii) An investigative POE is undertaken to ascertain how a building type complies with pre-set criteria or performance standards. The expected outcome of this type of POE is to determine the cause and effects of issues in building performance.

iii) A diagnostic POE attempts to establish the relationship between the objective measures of the physical environment and the subjective occupant perception of the building performance.

Furthermore while POE may be used to determine the compliance of a building with pre-set standards by measuring its technical attributes (Nicol and Roaf, 2005), it must be emphasised that a POE is not a mere measure of the objective performance of the building in areas such as spatial adequacy, lighting, heat insulation, acoustics and ventilation. POEs have been found useful in exploring cause-effect relationships between technical features and the users' physical and psychosocial needs. Hence, a POE may be used to determine users' actual spatial usage or occupants' subjective thermal comfort, which may not necessarily correlate with the technical performance of the building. As an example, Becker (1989) pointed at the failure of the design profession's ability to fully identify and embrace users' needs and expectation, suggesting that the marrying of the design professionals' expertise with the social scientists' knowledge of environmental behavioural may help resolve this conundrum, and bridge the gap between user expectation and contemporary architectural design ethos.

Architects are trained to design buildings and the subjective perception of building users may not be easy to translate into a designer's language. Indeed, the design profession has not fully appreciated the significance of returning to the erected structure in order to appraise how well it was, and it remained, fit for purpose. In the UK in particular, despite the known benefits of POE, the culture of evaluating the performance of a building after it has been built has not been successfully embedded in the design and procurement process in the last five decades since its introduction in the US in the 1960s (Cooper, 2001). Hadjri and Crozier (2009, p. 21) acknowledged this suboptimal culture of POE in the UK, and in comparison to the USA, Canada and Australia, argue that the latter group of countries "…have a more mature POE culture than the UK". There seem to be a sense of hesitation among building professionals to embrace the application of POE in practice. This is even more surprising because as early as 1965 the Royal Institute of British Architects (RIBA) in its *Handbook of Architectural Practice and Management,* recommended the implementation of Stage M: "Feedback", as the final part of its Plan of Work, (cited by Cooper, 2001), which required that architects revisit their design work after it has been constructed and occupied for two to three years in order to glean from it knowledge that may be used for the services of future clients (Bordass and Leaman, 2005a). After more than a decade, the lukewarm reception Stage M received from the industry prompted RIBA to withdraw it from the Architect's Appointment in 1972 (Bordass and Leaman, 2005a). More recently, RIBA introduced the explicit use of POE in the revised version of its handbook, under Plan of Work, Stage 7, (cited by Clements-Croome, 2013, p. 92), as a tool to improve the quality of buildings and deliver customer satisfaction. However, business and market pressures do not simply permit designers and builders to be interested in a building's performance after handover, as they move on to the next project (Way and

Bordass, 2005). Consequently, after more than half a century since its first introduction by RIBA, POE is still a scanty endeavour of research oriented academics, rather than being an embedded practice in the building procurement process in the UK.

One of the reasons for this indifference on the supply side of the building procurement industry is that there are no driving forces for design professionals to be interested in the performance of a building after it has been commissioned. Cooper (2001) suggests that the slowness of the UK building profession to adopt the use of POE as a standard part of the building procurement process lies in the ways architects are rewarded. A further obstacle to the mainstreaming of POE may be due to it being perceived as a potential source of conflict among stakeholders (Meir et al., 2009), as designers may simply not have a vested interest in exposing design errors which may result in potential liability and/or litigation (Riley et al., 2010). Another major impediment to the widespread use of POE is its retrospective nature (Way and Bordass, 2005). Building users and occupants may fail to buy into the POE scheme as part of the procurement project, as they may not see that the potential benefits derived from the process are commensurate with the disruption any retrofitting work would cause them, and they may not be able to use the insight gained through the POE exercise in the foreseeable future (Preiser, 2003). Furthermore, there are no agreed indicators that may be used for the evaluation of the performance of a building (Zimmerman and Martin, 2001); and owners of buildings may not have the technical expertise to appreciate the benefits that may result from a well-commissioned POE (Vischer, 2002). All these factors might have contributed to the lack of engagement of the UK building construction industry in POE.

Apart from its conundrums with POE, the UK construction industry had in the past been highly criticised for its lack of attention to client needs. For example, in *The Report of the Construction Taskforce,* Sir John Egan noted that one of the most crucial problems the building industry was facing was customer dissatisfaction (Egan, 1998). The taskforce, which was commissioned to undertake a diagnostic status investigation of the UK construction industry, found that the outcomes of projects were unpredictable with respect to time, cost and quality. Nevertheless the challenges of mainstreaming POE into the building procurement process in the UK, the construction industry has made substantial shift towards improving efficiency in the construction phase, which has resulted in more timely delivery of projects and buildings of higher standards. These are the results of not just political impetus, but also legislative instruments. More stringent building regulatory standards and an increasing appreciation of user expectations, especially in the special purpose and public buildings like healthcare estates, educational facilities and office buildings have given renewed impetus to engaging users in building evaluation practice in the UK (Riley et al., 2010; Meir et al., 2009). Public buildings are now expected to exhibit features that meet the needs of a wide range of users on the continuum of age (i.e. young and old); wellbeing (healthy and ill); abilities (disabled and able-bodied); and diverse sociocultural background. Some of these requirements were considered niche design features a few decades ago.

Another driving force and argument for mainstreaming POE in the UK building procurement industry is the European agenda on sustainability and sustainable buildings. For instance, the Energy Performance in Buildings Directive (Directive 2002/91/EC), established minimum energy requirements for new buildings and large existing buildings that are subject to major renovations (European Union, 2002). In a recast of this directive (Directive 2010/31/EU) in 2010, the European Union required Member States to draft national action plans to increase the number of nearly zero-energy buildings; i.e. buildings that consume very low energy or use energy predominantly from renewable sources, including sources near to the site of consumption (European Union, 2010). One of the cornerstones of the UK National Energy Efficiency Action Plan is the energy efficiency in building policy, with particular focus on energy efficient building renovations (Department of Energy & Climate Change, 2014). Energy performance, acoustics, fire safety and accessibility requirements are some of the many standards modern buildings must meet. Complying with all these regulatory requirements and standards in turn demands articulation of the various perspectives of a multidisciplinary team of experts, which can be facilitated by a POE regime (Preiser, 1995).

The POE exercise should be driven by the need "…to capture and disseminate lessons in order to support better decision-making in the briefing, budgeting, design, construction and operation…" stages of a building (Bordass, 2003, p. 407). It has been identified that once clients and users of existing buildings appreciate the business case for managing their facilities through POEs, future design briefs can be informed in order to build better performing buildings (Fisk, 2001). This presupposition, however, has failed to gain impetus in architectural practice and research, partly because POE is seen as de facto a post hoc assessment tool. Furthermore, as its name implies, 'post' occupancy evaluation is seen by some interested stakeholders as an afterthought, and that even if valuable information are garnered from the process, the present occupants may not readily benefit from such an exercise. The optimal outcome of a POE exercise for the present occupant is thus to 'retrofit'; i.e. correct already committed mistakes, and not preventing them from occurring in the first instance.

Over the decades after POE was first introduced in the United States, a number of alternative terms to POE have been circulated in the architectural design and research literature in the UK, the most prominent of which is 'building performance evaluation' (Manning, 1965), which was later conceptualised, formalised and structured by Wolfgang Preiser, one of the pioneers of POE (Preiser and Schramm, 1997). However, its initial momentum soon disintegrated into ad hoc market practices (Kelly et al., 2012). Concerns have been raised about the lacklustre approach of the construction industry stakeholders to embrace POE and incorporate it in mainstream building procurement procedures in the UK (Stevenson and Leaman 2010). In their study, Stevenson and Leaman (2010) point at the possibility to change building occupants' behaviour by feeding back on how efficient they are in their energy usage practices. While such information feedback may help influence occupants' behaviour, albeit in a positive direction, it is only an indirect measure of building performance. Therefore, unless an objective evaluation of a building's efficiency is undertaken, stakeholders would not obtain the full picture of the interplay between the building and its occupants. Stevenson and

Leaman (2010) were quick to point out that any cause-effect relationships deducted in such evaluation scheme would be misrepresented and, therefore, inconclusive. Nevertheless, the occupants' behavioural elements of a building performance evaluation should not be disregarded or underestimated.

Way and Bordass (2005) argue for a 'forward feeding' POE, which may help in aligning expectations of designers and users. Way and Bordass contend that a POE should feed forward for clients and feedback for designers. Central to such an argument is that the POE may no longer be fit for purpose as a means of testing users' satisfaction with the built environment, due to its retrospective nature. Way (2006) later introduced an alternative approach to obtaining feedback about the performance of buildings. 'Soft Landings' was piloted on a corporate headquarters migration project, in which Mark Way was the lead architect. The Soft Landings initiative affects three critical stages of the building procurement project; namely: briefing/programming, handover and aftercare. One of the critical success factors of Soft Landings was that the lead architect was actively involved in the handover stage and remained resident 'in situ' post-handover, offering aftercare services to the client, by monitoring on site the actual performance of the building for the first three years after handover. Way and Bordass (2005) contend that the aftercare involvement of the designer in Soft Landings was not just an optional 'add-on' to the project, but was an integral part of the contractual obligations of the project team. These obligations were detailed in a licensed Scope of Service document set. The underlying objective of the Soft Landings initiative was to "…increase designer and constructor involvement during and after handover of buildings to help clients get the best out of their new building…" and, thereby, reduce tensions that often arise during the initial period of occupancy (Way, 2006, p. 25). According to Mark Way, while Soft Landings delivers the greatest benefit for users in the aftercare stage, the collaboration between the design/constructor team and the client/user team actually starts at the briefing/programming stage, when the design brief is being constructed. As a minimum, the Scope of Service document would spell out the following terms of cooperation between the designer/constructor team and the user/occupant team:

a) greater clarity of the duties of all parties during key stages;
b) increased designer and constructor involvement before and after occupation;
c) a resident Soft Landings team during the users' initial settling-in period; and
d) monitoring and review of building performance for three years (Way and Bordass, 2005).

Mark Way concluded that apart from the obvious benefits for occupants/users, Soft Landings add measurable values to the business activities of the suppliers of building projects. The early stage collaboration reduces 'rework' and associated costs for the design team, creates an effective building readiness and better fine-tuning to improve the end product and the experience of clients and users, which increases the chances of the designer being referred in the future. A further advantage is that the wealth of knowledge accumulated over the three years of active follow up by the design team provides a good database for future POE and benchmarking of the project against itself and other projects. The extra cost associated with Soft Landings was "…less than 0.25% of the construction cost on a full-scope appointment" (Way and Bordass, 2005, p. 354). Despite these acclaimed benefits of Soft Landings and after more than a decade since it was first introduced, there are hardly any literary accounts of a follow up to the initiative. It has neither become a mainstream industry practice nor a niche approach to evaluating the performance of buildings. There may be some limitations to making Soft Landing a routine. For instance, not all projects are big enough to pay the extra cost of continuous engagement of the lead architect for three years after handover. Furthermore, there may simply not be sufficient space on site to accommodate a project team in house for the three years.

Bordass and Leaman (2005b) observe that despite increasing interest of academic and research realms in the evaluation of buildings, the people involved in building procurement process seldom engage closely with the performance of the buildings they have created. However, if well implemented, a POE may be used to make important strategic decisions during the operating lifespan of the building. For example, facilities managers may use a POE to make strategic decisions in a proactive manner instead of using the information derived from a POE to make reactive retrofitting and renovations (Eley, 2001). A good understanding of how POE is conducted established a theoretical and practical basis for the development of WEAT.

6.4 Assessing the Nursing Practice Environments

This section presents five instruments already in use for the assessment of Special Care Units (SCUs), such as nursing homes and specialised housing for older people. The review of these five instruments was undertaken, in the first instance, to establish the possibility of adopting or adapting them for use in this PhD study. However, despite the existing plethora of literature on post-occupancy evaluation, a review of the relevant literature sources shows that there is still a dearth of assessment tools to appraise the performance of healthcare facilities. The few assessment tools existing in the literature have been used to assess how healthcare facilities support the patient healing process (Gesler et al., 2004). This is not surprising, as contemporary design initiatives in the healthcare sector have long established the correlation between the physical design of wards and patient healing prospects (Stichler, 2001). An appreciation that the ward environment should facilitate a patient therapeutic healing process has in turn translated into an overt representation of patient needs in recently designed healthcare facilities, and to the negligence of other users (Rowlands and Noble, 2008). Hence, there does not seem to be an agreement within the healthcare facilities design community on how to incorporate diverse user needs in the design and procurement process. While hospital design in the UK has embraced the inclusive and universal design principles for some time, Gesler et al. (2004) argue that the architecture profession continues to dominate the way healthcare spaces are designed. More importantly, this power imbalance among the stakeholders of healthcare facilities extends beyond the design stage, to the use and management of healthcare facilities, as inequalities embedded in design continue to shape the relationships between doctors, health workers and patients (Gillespie, 2002).

The overall approach to modern hospital design has been that all its components should interact within a complex system that promotes a therapeutic environment for patient healing (Gillespie, 2002). This perceived focus of healthcare facilities to support the therapeutic healing of patients had attenuated endeavours from healthcare facilities design professionals that the healthcare environment must be inclusive and promote the support of all users through design (Curtis et al., 2007). Therefore when the focus of any tool to evaluate the design of hospital wards had been on the nursing practice environment, including hospital wards, the key area of assessment had been the psychosocial environment and organisational factors of the nursing profession (Lake, 2007). There is hardly any literary evidence of an environmental assessment tool designed specifically for the evaluation of the physical attributes of the hospital wards from the perspective of the healthcare staff and the tasks they perform.

The contributions made by ward architectural design features to the healing of patients have been identified for centuries. A well-known example of one of the earliest appreciation of this emerged from Florence Nightingale, who suggested that patients would recover more quickly from illnesses in an environment equipped with basic sanitation, ventilation, natural light, and general cleanliness (Karasek, 1979). Likewise, researchers have long been interested in how the design of the physical environment supports patient and healthcare staff outcomes (Leaf et al., 2010). While it is widely held that the main function of the hospital ward is to enhance patient healing in a safe and dignified environment (Baillie, 2009), the contributions that medical and healthcare teams make to support the patient is also very important in the healing process. Ward nurses, in particular, play a pivotal role in the coordination of treatment activities aimed at supporting patient healing. For example, the higher frequencies of nurse visits to patient rooms and the quality of patient-nurse interactions have been found to positively correlate with patient chances of recovery (Cleary, 1999). However, responses to patient needs is significantly influenced by patient visibility from the nurse station and by the design of the layout of the ward environment (Lu and Zimring, 2012). Likewise, a study conducted in the US suggests that the poor ergonomic design of "…nurses' station leads to back stress, fatigue, and other injuries among nursing staff'' (Zimring et al., 2004, p. 5.). Furthermore, ward layouts have been found to affect nurses' movement behaviours (Hendrich et al., 2009), and redundant nursing activities due to unnecessary movements lead to less time being spent at patient bedsides and may cause tiredness and reduced productivity in nurses (Choudhary et al., 2009).

A comprehensive ward environment assessment tool that supports the nursing practice has, hitherto, eluded the healthcare design community. There are, however, a handful of environment audit tools that are being used to evaluate the performance of specialised facilities like nursing and residential care homes that cater for people with cognitive disabilities, like dementia. While these tools have been used to assess the suitability of the architectural design features of the care environment for persons with physical, cognitive and sensory impairments, a number of lessons can be learned from their practical applications. For example, the design of the physical environment has been identified as being an important therapeutic resource in promoting the functional ability of people with dementia living in care homes (Day et al., 2000). Furthermore, physical design and architectural composition has been found to enhance the wayfinding abilities of persons with Alzheimer's disease in a nursing home setting (Passini et al., 2000). It is therefore worth exploring what these tools have to offer regarding the assessment of architectural design features of the physical environment in a hospital ward setting.

Annandale et al. (1999) purport that the most important criteria of a useful measurement tool is that it must be theory-based, reliable, valid, relevant to the unit of analysis, and relatively easy to administer. However, measuring the characteristics of the physical environment in a healthcare setting with respect to how well they meet user needs is quite a daunting exercise. An effective environmental assessment tool should be designed to gauge the actual level of performance of the facility against predetermined standards and/or against user needs and expectations.

The following sections present five environmental assessment tools reviewed in the process of developing WEAT. The review took the form of analysing the main objectives of the tool, and assessing the correlation of the domains of each tool with the other reviewed tools' domains. The purpose of this approach was to develop a consensual inventory of domains and establish how these correlate with the four domains that WEAT also purports to assess (Table 6.1). All the assessment tools reviewed were developed to measure the suitability of SCUs for people with physical, cognitive and sensory impairments. Since no one instrument was found in literature that would have perfectly fulfilled the requirement of this study, the search strategy used to source potential health environment assessment tools was to ensure that they to greater or lesser degree focus on the four personal constructs that WEAT should also assess, namely, physical, cognitive, sensory and universal.

6.4.1 Multiphasic Environment Assessment Procedure (MEAP)

The Multiphasic Environment Assessment Procedure (MEAP) has a number of components, one of which, the Physical and Architectural Features (PAF), is concerned with the physical environment. In its entirety the MEAP can be used to identify resident and staff characteristics, critiquing the physical and architectural features of a facility, determining residents' and staff members' appraisals of the social climate and evaluating the judgments of external observers (Moos and Lemke, 1996). However, for the purpose of this study, the PAF was examined in greater detail. The PAF consists of more than 175 individual items grouped into 9 domains. PAF was developed by Moos and Lemke (1980) and its items represent environmental resources for a given area of human functioning and focuses on the availability of such resources rather than actual utilisation. The nine domains of the PAF are: (i) physical amenities; (ii) social recreational aids; (iii) prosthetic aids; (iv) orientation aids; (v) safety features; (vi) architectural choice; (vii) space availability; (viii) staff facilities; and (ix) community accessibility. Please see Appendix 6.1 for a full description of each of the nine PAF domains. All the items of PAF are scored equally using "dichotomous natural metrics" (Moos and Lemke, 1980, p. 574). For items with subscale, these items are weighted equally. The higher the score the better represented the environmental resources in the evaluated facility. It has been demonstrated that MEAP can be used to regularly evaluate the physical characteristics of care homes, and thus could serve as a management information tool for the operators and managers of these facilities (Hatcher et al., 1983).

6.4.2 Professional Environmental Assessment Procedure (PEAP)

The Professional Environment Assessment Procedure (PEAP) is a tool developed by Lawton et al. (2000) to measure the quality of SCUs for older people with onset of dementia. It was designed to be used by trained professionals to provide a standardised and global measure of the quality of dementia units. Like other environment assessment tools, PEAP consists of eight domains of how the design of the physical environment of nursing and care homes support the quality of life of an older person with dementia. The nine domains are: (i) awareness and orientation; (ii) safety and security; (iii) privacy; (iv) regulation and quality of stimulation; (v) functional abilities; (vi) personal control; (vii) continuity of self; (viii) social contact. Please see Appendix 6.2 for a full description of each of the nine PEAP domains. To assess the suitability of a particular domain the observer would be required to make the following decision. As an example, in the assessment of social contact, the observer would be expected to judge "…the extent to which the physical environment and rules governing its use support social contact and interaction among residents" (Norris-Baker et al., 1999, p. 170). The PEAP consists of a five-point rating schedule of the nine domains. These domains are assessed based on the extent to which the physical characteristics of the SCU support the stated needs of an older person with cognitive impairment in a nursing and care home setting. The ratings on these domains are descriptive and allow the evaluator latitude of judgment in the rating procedures. The scale points for each domains are (points in parenthesis): exceptionally high support (5); high support (4); moderate support (3); low support (2); unusually limited or low support (1) (Norris-Baker et al., 1999). Administering PEAP requires a high level of expertise of a researcher experienced in the field of person-environment relations.

6.4.3 Therapeutic Environmental Screening Survey for Nursing Home (TESS-NH)

The Therapeutic Environmental Screening Survey for Nursing Homes (TESS-NH) was developed in the United States in the early 1990s by a workgroup that was commission by the National institute of Aging. The main goal of the workgroup was to develop an instrument that could be used to assess the suitability of the physical environment of Special Care Units for persons with dementia (Sloane et al., 2002). TESS-NH is a substantial revision of its previous version (Therapeutic Environment Screening Scale (TESS) (Sloane and Mathew, 1990). TESS-NH was developed based on the premise that a poor fit between the physical setting of the environment and an individual's needs and expectations may result in adverse behavioural outcomes (Lawton and Nahemow, 1973b). Hence, the major goal of the instrument was to offer support to the attainment of the six critical affordances expected from the physical characteristics of an SCU for long-term care, based on other instruments reviewed for the development of TESS-NH. These affordances are (i) provision of safety, security and physical health; (ii) orientation; (iii) provision of privacy, control, and autonomy; (iv) stimulation (both negative and positive); (v) enhancement of socialisation (social milieu); and (vi) personalisation/familiarity (Sloane et al., 2002, p. S70). The authors developed 84 discreet items plus one global item covering 13 domains. These domains are: (i) exit control; (ii) maintenance; (iii) cleanliness; (iv) safety; (v) orientation/cueing; (vi) privacy; (vii) unit autonomy; (viii) outdoor access; (ix) lighting; (x) noise; (xi) visual/tactile stimulation; (xii) space seating; and (xiii) familiarity/home-likeness. Please see Appendix 6.3 for a full description of each of the 13 TESS-NH domains. The resultant TESS-NH emerged as a tool to measure the presence of these domains, by building on the existing Therapeutic Environment Screening Survey (TESS: an assessment tool consisting of a twelve-item checklist against which the appropriateness of a nursing home unit may be determined) (Sloane and Mathew, 1990). All observed items are recorded in a checklist format indicating the ‘presence’ or ‘absence’ of the design feature. For example the presence of an item is scored ‘1’ and its absence is cored ‘0’. The higher the aggregated score of an SCU the more favourable the attributes of its physical environment. A relatively junior researcher could administer the TESS-NH, after a few hours’ training of how to use the tool, by conducting a walkthrough of the SCU facility. The walkthrough audit takes between 45 – 90 minutes.

6.4.4 Sheffield Care Environment Assessment Matrix (SCEAM)

The Sheffield Care Environment Assessment Matrix (SCEAM) was the first most comprehensive UK-based assessment tool designed for the evaluation of the physical environment for persons with dementia. It was developed by researchers at the University of Sheffield, who used the tool to assess the extent to which the architectural design features of the physical environment support the quality of life (WHOQOL, 1998) of residents of nursing and care homes with physical and cognitive frailties (Parker et al., 2004). The study itself was situated in Sheffield, UK, from where the assessed nursing and care homes were selected. A total of 42 SCUs and 294 residents were recruited for the study. The researchers conceptualised quality of life to cover 11 domains including: (i) privacy; (ii) personalisation; (iii) choice and control; (iv) community; (v) safety and health; (vi) support for physical frailty; (vii) comfort; (viii) support for cognitive frailty; (ix) awareness of outside world; (x) normalness and authenticity; (xi) provision for staff. Please see Appendix 6.4 for a full range of examples used to describe each of the 11 SCEAM domains. The domains were classed into four groups, depending on aspects of quality of life they purport to support; three representing the provisions for residents and one for staff. These main groups are: universal, physical, cognitive, with the fourth standing alone as facilities for staff members, which has been claimed to influence quality of care (Netten, 1989). The study identified seven building elements that were assessed in 11 domains, based on more than 300 carefully selected architectural design features gleaned from architectural and gerontological literature. The architectural spaces or building elements evaluated for suitability were: location; outside spaces; building form and circulation; day spaces; bathroom and WCs; resident private rooms and staff spaces. The authors acknowledged that from the literature search, the most comprehensive list of architectural design features was sourced from Moos and Lemke (1996) as used in MEAP. Each building element was assessed based on its expectation to support certain domains by exhibiting a certain cluster of architectural design features. Each design feature was scored as ‘present’ (1) or absent (0). For example, the domain “privacy” has 40 architectural design features, and a building that fulfilled 30 of the 40 architectural design features would score 75% in that particular domain. Architectural design features were scored either as “designed” or as “in use”. A shower facility used for storage would score ‘1’ for design but ‘0’ for use. The focus, obviously, being on how spaces were used rather than on what they were designed for. This allows the tool to be used to ‘unpick’ unfavourable architectural design features of a building element or the changing needs or behaviours of its users. One of the key strengths of SCEAM is that its administration does not require building design expertise and the assessment of a large building could be undertaken in half a day.

6.4.5 Evaluation of Older People's Living Environments (EVOLVE)

EVOLVE is a tool for evaluating the design of older people's housing needs. It was developed to facilitate the evaluation of the design of housing schemes or individual dwellings in order to assess their suitability as accommodation for older people (Lewis et al., 2010). EVOLVE is a comprehensive evaluation checklist consisting of 487 items for a single dwelling and 2020 items for a housing scheme, assuming that only one apartment or bungalow is being assessed. These items are categorised into 13 domains divided into two large groups, based on the types of needs these domains are expected to support. The first group of needs is called the "universal needs" domains, which is described as the needs of all persons using the built physical environment. The second group of needs is called the "support for older age" domains, whose constructs largely correlate with the needs of persons with cognitive impairments (as will be seen later). Its universal needs domains includes: (i) personal realisation and choice; (ii) dignity and privacy; (iii) comfort and control; (iv) personal care; (v) social support inside building; (vi) social contact outside. Its support for older age domains includes: (vii) accessibility; (viii) physical support; (ix) sensory support; (x) dementia support; (xi) health and safety; (xii) security; and (xiii) working care. Please see Appendix 6.5 for a full description of each of the 13 EVOLVE domains. EVOLVE can be used at the design stage of new buildings to provide evidence-based design and for evaluation of existing building stock. The evaluation process involves a walkthrough of the apartment or housing scheme and completion of a checklist. Each item in the checklist is scored as 'yes', 'no', 'not in use' or 'n/a'. While it has been explicitly stated by its authors that EVOLVE is not suitable for the assessment of SCU for persons with cognitive impairment, it was, nevertheless, included in this study for three reasons. First, the tool contains a specific set of domains that are dedicated to the assessment of how the physical environment support the quality of life of older people or persons with mild cognitive impairment such as early stage dementia (see "support for older age" domains). The second reason EVOLVE was included in this evaluation of tools is for its methodological approach. A detailed and simplified account of how the tool was developed was given by the authors, including the piloting, testing and validation. Also, the authors provide useful tips on how to administer the tool, including the use of an electronic format. Lastly, credence is given to EVOLVE because of the multilateral stakeholders that supported its development. This includes the Personal Social Services Research Unit (PSSRU, 2015); Housing Learning and Improvement Network (Housing LIN, 2015); Elderly Accommodation Counsel (EAC, 2015); University of Kent, and was funded by the Engineering and Physical Sciences Research Council (EPSRC, 2015). Some of the members of the research group that created EVOLVE were also involved in the construction of SCEAM from the University of Sheffield, which was the tool that eventually formed the background for the development of WEAT.

6.4.6 Concluding Remarks on the Reviewed Assessment Tools

There is literary evidence to suggest that all these tools can be used to aid the evaluation of the design of the physical environment for people with dementia in other contexts beyond the original setting in which their authors developed them. This section provides literary accounts of studies undertaken using each tool, where this was available. More importantly, these tools were selected for review due to their accounts of evaluating the physical architectural design features of the built environment by exploring some or all of the constructs this PhD study is also seeking to explore; namely, physical, cognitive, sensory and universal. Table 6.1 summarises the extent to which these tools covered each of these constructs in their individual approaches.

Slaughter et al. (2006) acknowledge that these tools can be used to assess how SCUs may support the needs and abilities of persons with dementia or frail older people. However, they contend that the underlying principle is their support for "quality of life". Slaughter et al. (2006) also argue that there was a significant overlap in the basic constructs these tools assess and that, overall, most of the approaches have the following constructs in common: i.e., "…privacy, autonomy, personalisation, orientation, safety and support for functional limitations" (Slaughter et al., 2006, p. 1436).

TABLE 6.1: Summary of Environmental Assessment Tools Reviewed

REVIEWED TOOLS	CONSTRUCTS COVERED BY TOOL	CORRELATIONS WITH WEAT CONSTRUCTS
MEAP	(i) physical amenities; (ii) social recreational aids; (iii) prosthetic aids; (iv) orientation aids; (v) safety features; (vi) architectural choice; (vii) space availability; (viii) staff facilities; and (ix) community accessibility. (See Appendix 6.1 for detailed definitions).	Physical, Cognitive, Universal
PEAP	(i) awareness and orientation; (ii) safety and security; (iii) privacy; (iv) stimulus regulation; (v) stimulus quality; (vi) functional abilities; (vii) personal control; (viii) continuity of self; (ix) social contact. (See Appendix 6.2 for detailed definitions).	Cognitive, Sensory, Universal
TESS-NH	(i) exit control; (ii) maintenance; (iii) cleanliness; (iv) safety; (v) orientation/cueing; (vi) privacy; (vii) unit autonomy; (viii) outdoor access; (ix) lighting; (x) noise; (xi) visual/tactile stimulation; (xii) space seating; and (xiii) familiarity/home-likeness. (See Appendix 6.3 for detailed definitions).	Physical, Cognitive, Sensory, Universal
SCEAM	(i) privacy; (ii) personalisation; (iii) choice and control; (iv) community; (v) safety and health; (vi) support for physical frailty; (vii) comfort; (viii) support for cognitive frailty; (ix) awareness of outside world; (x) normalness and authenticity; (xi) provision for staff. (See Appendix 6.4 for examples of items used to asses constructs).	Physical, Cognitive, Universal
EVOLVE	(i) personal realisation and choice; (ii) dignity and privacy; (iii) comfort and control; (iv) personal care; (v) social support inside building; (vi) social contact outside; (vii) accessibility; (viii) physical support; (ix) sensory support; (x) dementia support; (xi) health and safety; (xii) security; and (xiii) working care. (See Appendix 6.5 for detailed definitions).	Physical, Cognitive, Sensory, Universal

Starting with MEAP, it is one of the oldest and well-established instruments used for the measurement of the attributes of the physical environment; it provides the most comprehensive environmental assessment instrument for use in nursing facilities (Cutler et al., 2006). It may offer more nuance information about individual residents and their fit within the environmental setting. However, MEAP has also been criticised for its bias towards large SCUs, and, due to its complex nature, may not be readily usable by a less experienced researcher (Fleming, 2011).

Schwarz et al. (2004), used PEAP to evaluate the effect of design interventions on a dementia care setting that was due for renovation. They examined the SCU pre-renovation and post-renovation, using PEAP, which established that enhancing certain aspects of the nine constructs of PEAP facilitates the quality of life of the residents. To achieve this, Schwarz et al. (2004) combined PEAP with behavioural mapping of interactions between staff and residents. Hence, the study reaffirms that modifications to the "…architectural environment must be orchestrated with appropriate organisational, staff and social changes to achieve the full potential of a physical design based on homelike characteristics" (Schwarz et al., 2004, p. 176). Therefore, the dichotomy in characteristics of the care environment, portraying the resemblance of a 'homelike' domestic atmosphere for the care receiver, and at the same time, serving the purpose of a 'professional' workplace for the caregiver must be seamlessly integrated.

Likewise, Andersson (2011) used the TESS-NH as a complementary tool to gather evidence on how architectural space may support an older person suffering from dementia in SCU setting. The study evaluated the interior characteristics of the communal spaces of SCUs prior to, and after, remodelling. While the overall results of the study were mixed in terms of the success of the remodelling project, Andersson (2011) reiterated that TESS-NH is an assessment tool that could be easily integrated into the architecture profession's toolbox of evaluative methods to provide an improved assessment of criteria necessary for a supportive architecture for the frail older people. In this qualitative research study, Andersson (2011) used TESS-NH complementarily alongside other data collection methods, such as interviews, document survey and an architecture profession method, which allowed the researcher to establish some "…degree of triangulation of the collected research data" (Andersson, 2011, p. 182). This combined use of TESS-NH supports the argument to use WEAT alongside other forms of data collection, such as interviews, to establish a basis for triangulation in this PhD study.

Subsequent to the first literary account of SCEAM in 2004, the tool has been used in other settings apart from the one for which it was originally developed. It has been used in pilot studies for the assessment of hospital wards, and "…been found to need little adaptation" (Parker et al., 2004, p. 959). For example, Hadjri (2008) used SCEAM to assess the physical environmental features of sheltered housing in the Belfast area in Northern Island. SCEAM was used in this study as a diagnostic tool to identify issues relating to accessibility, adaptability, personalisation, and safety. More recently SCEAM, has been tested and adapted for use in Sweden, where it was found to be suitable, apart from minor modifications to reflect the local sociocultural environment of the Nordic country (Nordin et al., 2015).

EVOLVE has only been around for a few years, however, it has been used to assess the adequacy of the physical features of the built environment other than those described by its authors. For instance, Rooney (2014) used the EVOLVE checklist in comparative analysis of housing for the visually impaired.

The study compared the homes of three groups of visually impaired people. EVOLVE was used in the study to explore the major differences between housing built to the lifetime homes standards and non-lifetime home standards in Northern Ireland, and specialist apartments in England, and their suitability for the visually impaired. Lifetime Home design embraces the principles of "…inclusivity, accessibility, adaptability, sustainability and good value…" and ensures that people can live in their own home for longer (Lifetime Homes, 2011). Furthermore, given that EVOLVE was designed for use in an extra care housing setting, its configuration of constructs and methodological approach, makes it an appropriate tool against which WEAT may be benchmarked.

To summarise, the following are the key learning points from the five tools reviewed, which are noteworthy for the development of WEAT:

1) All of these tools are used to assess the physical environment where frail or cognitively impaired older people are located.
2) They all attempt to embrace, integrate and balance the needs of a diverse population of users in an SCU: for its residents, in a 'homelike' environment and for the caregivers, in a 'quasi workplace'.
3) All the tools employ the use of inclusive or universal design principles.
4) All the tools use the principles of post-occupancy evaluation of the physical environment, by focusing on user needs. However, the extent to which the principles of POE have been fully incorporated is debatable. For instance, questions could be raised in the ability of the tools to obtain the views of cognitively impaired users.
5) Some of the instruments were used in combination with other instruments or methods of data collection in the cited studies, which suggests that the tools could be useful as corroborative evidence in conjunction with other methods (e.g. TESS-NH).

The rationale to develop WEAT has been explored in detail in section 6.2 of this thesis. However, it is important to recap on how the five instruments reviewed in this chapter helped in the construction of WEAT. While each of the five instruments might have partially fulfilled the purpose of assessing a ward environment, none of them could be adopted 'off the shelf' for use without substantial compromise. However, quite a lot could be learnt from each of them to support the development of a ward environment assessment tool that would be fit purpose in this study. Firstly, these tools are used to assess the adequacy of the physical environment for older people, while WEAT would be used to conduct the post-occupancy evaluation of ward environment from the perspective of older nurses. Secondly, it must be appreciated that the ward environment does not function in isolation. The needs of other users, notably patients, must be considered. WEAT embraces the needs of pre-existing users, and seek to improve the ward environment so that nurses would better function in this setting. Thirdly, the application of the inclusive and universal design principles, only emphasises this notion. Fourthly, these tools use post-occupancy evaluation principle, which means the spaces being assessed are occupied by users and therefore the assessor, may benefit from the interrogation of these users to corroborate 'objective' assessment of the physical environment.

6.5 Ward Elements

In order to assess the performance of a ward environment, it is crucial to establish the spatial components of a typical hospital ward. Hurst (2008) see healthcare facilities as a constituent of models that represent space as either *a path* that connects nodes, which are situated around a sequence of activities, or a resource *node* in itself. For example, an effective configuration of a ward will consist of the route or ***path*** to be travelled by a nurse between a nurse station and the patient bay, the design of which is defined by the sequence of steps to be followed in order to arrive at optimal patient and staff outcomes. In between the nurse station and the patient bay, the nurse may have to visit other spaces like the clean utility or storage room before proceeding to the original destination in the given configuration. There is sufficient research evidence that design of the pathways between and across these spaces correlates with nursing patient care behaviour (Tyson et al., 2002), and consequently on patient healing (Schweitzer et al., 2004). In a ward setting a space may also be used as a resource ***node*** in itself, constituting a nurse station, patient bays or a day room. Since healthcare facilities and their wards are designed with a predetermined workflow, it follows that nursing patient care behaviours may also be predetermined through these design concepts. The way the nodes are connected by the paths may generate various probabilistic patterns of movement among the users (Choudhary et al., 2009).

Following on from the above understanding of the interrelationship between nodes and paths, therefore, the simplest form of patient nurse interaction and the associated spatial elements that facilitate such an interaction can be configured from three basic elements. These are the nurse station, the patient bay and circulating or connecting areas (which are collectively called corridors for the purpose of the study). The nurse station and the patient bay being the node resources and the corridor being the path resource (Figure 6.1).

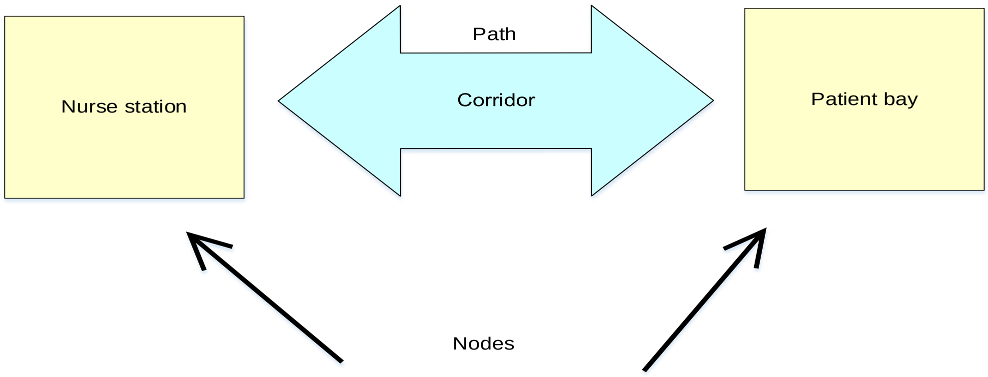


FIGURE 6.1: A Simple Spatial Configuration of Patient-Nurse Interaction

This section presents the ward elements identified from the 20 investigative interviews conducted with nurses recruited from the case study sites. The empirical data collection for this study was primarily from the NHS Lancashire Teaching Hospital Trust. Four surgical wards were investigated in this context where patients are admitted for surgical interventions.

The spatial components of the wards are termed ‘ward elements’. A ‘ward element’ may be defined as a physical space or structure of the ward that offers functional support to patient therapeutic healing process and facilitates nursing tasks. Hence a comprehensive list of the ward elements was compiled during the investigative interviews. In total 14 wards elements were identified from the investigative interviews to constitute those physical or spatial components of a typical hospital ward with which nurses must ‘interact’ in the course of performing their duties. The spatial configuration of these ward elements and the ward layout is potentially a resource or an impediment for nursing tasks.

Table 6.2 presents the list of ward elements that emerged from the investigative interviews analysis, the list of coded sources from where each ward element was identified and the number of participants that mentioned these ward elements, as derived from NVIVO. Following ethical protocol and for data protection and anonymity, the 20 participants in the investigative interviews have been coded as P1 to P20.

TABLE 6.2: Ward Elements and Sources of Identification

Code	Ward Elements	(Sources) Participants	Number of sources
WE01	Nurse station	P6,P7,P8,P10,P12,P14,P15,P16,P17,P18	10
WE02	Patient bay	P1,P2,P5,P6,P7,P8,P9,P10,P11,P12,P13,P14,P15,P16,P17,P19,P20	17
WE03	Side room	P4,P6,P7,P10,P15,P16,P17,P19	8
WE04	Staff room	P1,P4,P7,P13	4
WE05	Ward manager’s room	P18	1
WE06	Doctor’s office	P10,P13,P18,	4
WE07	Day room	P13,P19	2
WE08	Corridors	P4,P9,P10,P12,P13,P16,P18,P20	8
WE09	Storage room	P1,P7,P10,P12,P13,P20	6
WE10	Clean utility	P7,P12,P16,P20	4
WE11	Sluice	P1,P6,P10,P16,P18	5
WE12	Bathroom & WC	P1,P4,P5,P7,P8,P9,P10,P12,P13,P15,P16,P17,P18,P19,P20	15
WE13	Kitchen	P1,P8,P12,P14,P18	5
WE14	Entrances & exits	P2,P16	2

Figure 6.2 presents an NVIVO extract depicting the coded ward elements. In order to verify that the identified ward elements were complete, a walking interview was conducted with a ward sister who did not participate in the investigative interview. A walking interview is undertaken when the researcher and the interviewee together move around a designated spatial environment in order to stimulate interviewee’s responses (Evans and Jones, 2011). The list of the previously identified ward elements was shown to the sister, who was asked to check and confirm that all the elements that emerged from

the interviews were true as shown. The ward sister did not highlight that any items were missing from the compiled list of ward elements. This verification stage reduced the risk of misinterpretation and thus eliminated a ‘snowball effect’ of errors. This short corroborative follow up interview also allowed the researcher to be shown some of the ward elements in order to get an idea of the current state of design within the ward.

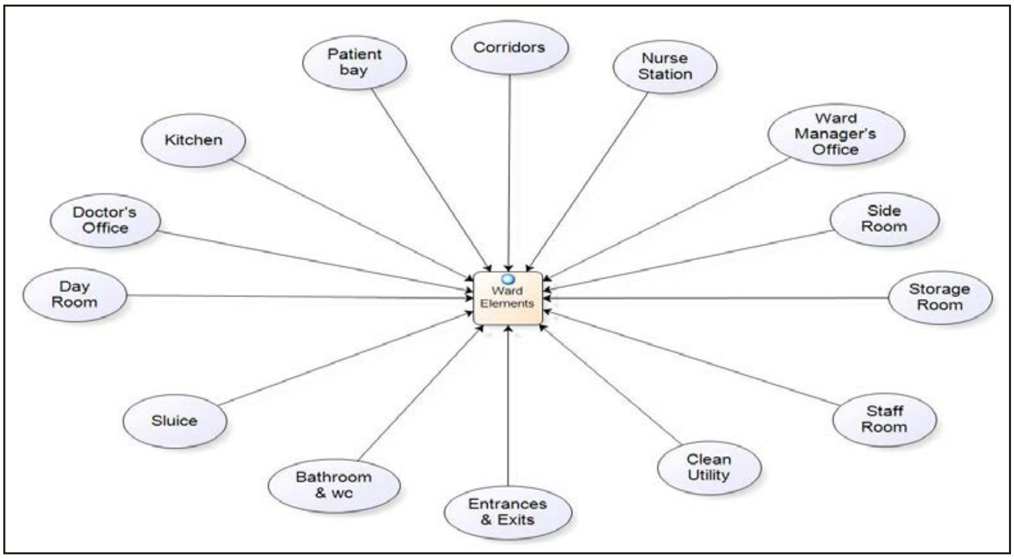


FIGURE 6.2: Ward Elements coded from NVIVO

As noted above, the simplest spatial configuration that facilitates the patient nurse interaction consists of the nurse station, the patient bay and the connecting corridor. These three ward elements are presented in the following subsections with an example each of the corresponding typical design issues quoted from participants. These design issues must be addressed in order to promote positive patient outcomes, facilitate the nursing tasks and support a healthy work environment for nurses. A compilation of these typical architectural design issues constitutes aspects of the Ward Environment Assessment Tools that the ward element must fulfil, which in turn form part of the NTEA Framework presented in Chapter 8.

6.5.1 Nurse station

The nurse station is a central position in a ward. It is the “…heart and soul of the nursing care activities in a hospital…” (Zborowsky et al., 2010, p. 21). Between the patient bays and the nurse station, one of the most important feature of a ward is to facilitate visibility; i.e. how visible is the patient to the nurse from the nurse station, and how may the patient arouse nurse attention, if needed. This notion is largely reverberated from the participant responses with respect to the position of the nurse station within the ward layout; as suggested by participant P16 in the example given in Figure 6.3.

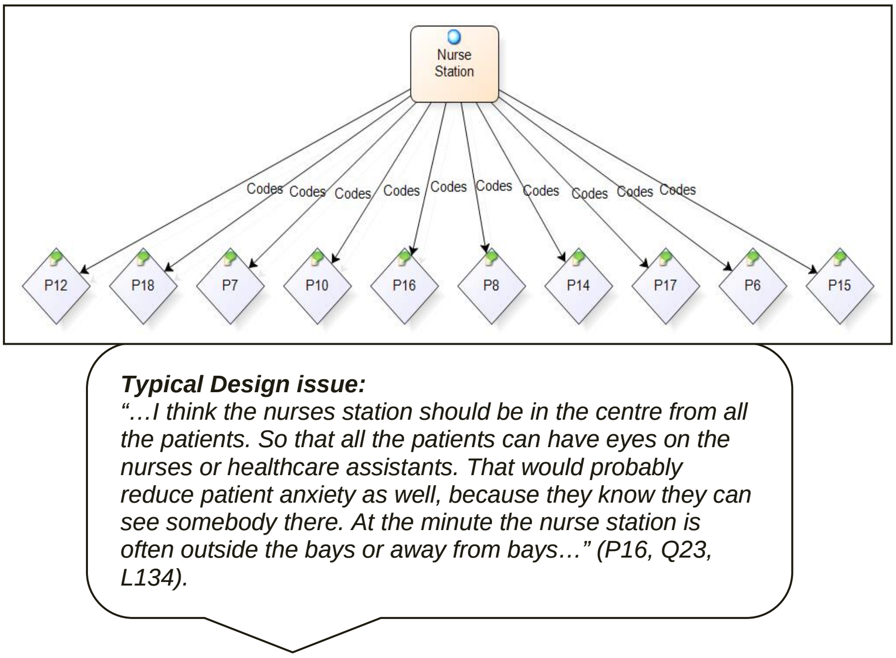


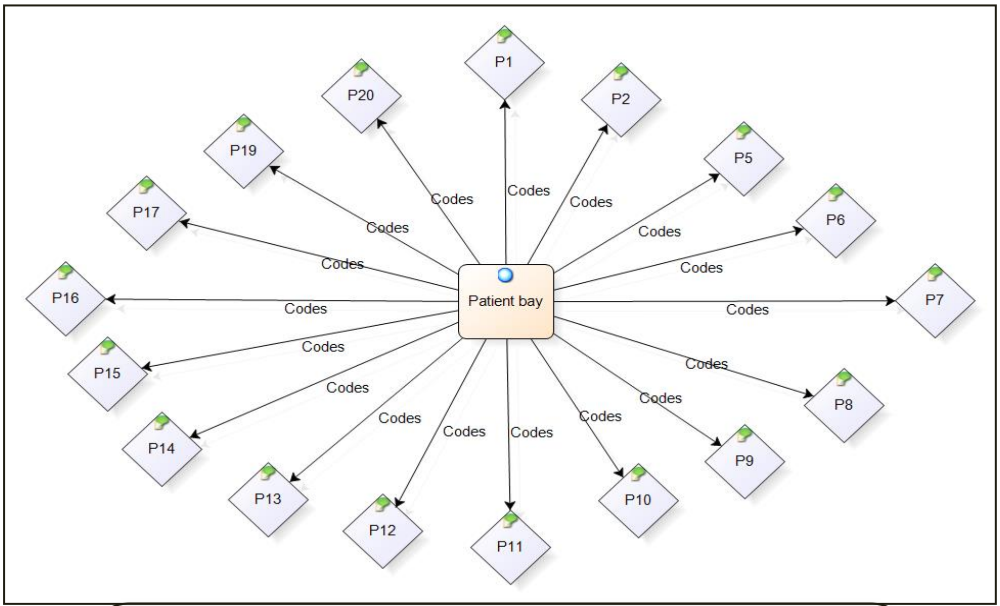
FIGURE 6.3: Nurse Station – Source of Evidence and an Example of a Critical Design Feature

(Extract from NVIVO Coding)

The visibility of the nurse by patients has been attributed to reduced patient anxiety and faster patient healing. As suggested by Lu and Zimring (2012, p. 862), "…nurses must remain continuously aware of the condition of the patients assigned to them even away from the patient rooms…, and visibility to nurses can reassure patients that nurses are still aware of them, resulting in less stressful situation for patient". Furthermore, due to the amount, variety and complexity of the tasks that a nurse performs at and from the nurse station, careful design of this ward element is very essential.

6.5.2 Patient bay

A patient bay is the room where patients are admitted and accommodated in the hospital ward prior to medical/surgical interventions. Most NHS hospital wards will have multiple-bed bays with four, six or more patients. Although, single occupancy room wards are beginning to gain prominence in the UK, patients, nurses and other persons coming in contact with an NHS hospital ward are more likely to experience multiple occupancy patient bays. The demands on bed spaces are coupled with the amount of tasks and activities that need to be performed around the bed area, which was of concern to some participants. (See Figure 6.4: Participant P7).



Typical Design issue:
"The space, there is not a lot of space in the bed spaces. We are restricted either by the curtain or if we are in the side room, there is not a lot of space in the side room. Obviously, we need to have privacy and dignity. So we need to have these curtains around. So if we are using a sling... or a hoist, sorry, it is quite hard to get that in there, as well as you've got the table the bed, the bed cabinet, it is very difficult" (P7, Q15, L67).

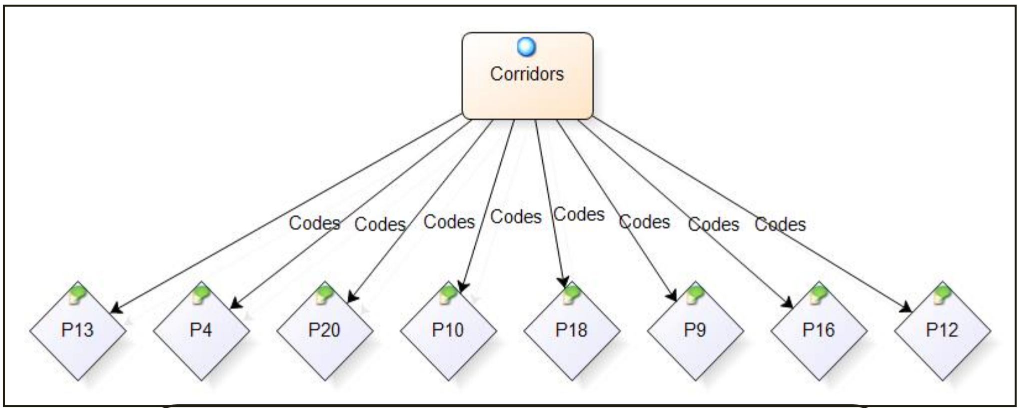
FIGURE 6.4: Patient Bay – An Example of Key Issues

Extract from NVIVO coding

There is a growing body of literature that argue for an overhaul of the patient bay layout and for an increase in the space around the bedside. The justification behind this argument is that while advancements in medical technology have produced newer and better equipment for more effective patient healing, this will not achieve optimal performance if the model of care is out dated. Patient-centred care should bring the treatment to the patient and not the patient being moved to various procedures. Gallant and Lanning (2001), for example, claim that moving patients from one care point to another is disruptive for patient care, resulting in additional time and cost and with very little value added. Frequent movement of patient to procedures increases health risks for patients and safety risks for caregivers. 'Bringing the treatment' to the patient bedside, therefore, requires adequate bedside space to accommodate medical equipment and staff. It has also been reported that the factors affecting space requirements in the bedside include medical and personal activities being undertaken; the patient's functional capacity; their dependence on caring staff; and the use of different types of equipment and furniture (NHS Wales, 2005).

6.5.3 Corridors

A hospital ward corridor serves multiple functions. As a ‘path’ resource, a corridor may constitute a circulating area by connecting all the functional parts of the ward; creating a medium of visual relationship between patient and nurse; serving as the channel through which people and equipment are transferred within and outside the ward areas; and facilitating ventilation and regulated air exchange across the ward elements. Apart from these explicit functions a corridor may also serve as a ‘node’ resource by serving some implicit ad hoc or regular purposes such as being a place of social interaction, informal communication or even an official meeting place as suggested by participant P10 in Figure 6.5. The participant gave a brief narrative of how a crucial part of the nursing tasks, i.e. doctor’s ward round was being conducted on the corridor due to lack of adequate space.



Typical Design issue:
“Here, we have a doctor’s ward round on the corridor, the beds and trolleys are there… and you are like ‘Can you move?’ ‘Get out of the way, I’ll try to get past you’. Or the dinner trolley comes up, which is massive, and you like ‘Can you all move out of the way, we’re moving trolleys, we need to get past’. It’s just a bit tight”. (P10, Q17, L62).

FIGURE 6.5: Corridors – An Example of Key Issues

Extract from NVIVO coding

Research has conclusively shown that the positioning and the form of corridor influences the overall ward layout, which in turn has an impact on nursing staff behaviours including the quality of patient-nurse interactions and the outcomes for both patient and nurses (Yi et al., 2014). Other studies have suggested that eliminating wards corridors through radial design with centralised nurse station increases the amount of time nurses spend at the patient bedside (Trites et al., 1969).

6.6 Constructs of Investigation

As suggested in Chapter 4, the three main constructs of older nurses affected by the demands of the workplace are physical, cognitive and sensory. The Ward Environment Assessment Tool has been constructed to explore and assess the extent to which the physical attributes of the ward support or enhance the outcomes of these constructs for nursing staff in a hospital ward setting. The following sections present the evidence from the investigative interviews on how these three constructs are affected by architectural design. There is empirical evidence from the investigative interviews to suggest that a fourth construct should be included in WEAT (see Section 6.6.4 below). This construct is termed the universal construct, which essentially covers all the areas of universal needs of a nurse interacting with the ward elements, such as privacy, dignity, and comfort.

The principal purpose of WEAT is diagnostic; i.e. it is a tool to be used to identify and unpick problem areas on hospital wards, through a walkthrough POE survey. While suggestions and recommendations may be made at the framework level (see Chapter 9), WEAT is an assessment tool that can be used on a stand-alone basis to measure how architectural design of a hospital ward meets certain criteria that have emerged from reliable architectural design guidelines and research design literature sources. Hence the following sections are a presentation of some examples of the empirical and literary evidence to demonstrate how the four constructs of WEAT have been constructed.

The architectural design features of the hospital ward must be assessed in its ability to support ward nurses in the performance of nursing tasks. The need for support and the nature of support that should be afforded ward nurses by architectural design features depend, to a large extent, on the complexity of the tasks that particular ward element should support. The question is how can evidence-based research be employed to support the design of better and more user-centred hospital wards, from the perspectives of nurses?

6.6.1 Physical Construct

The physical construct consists of those physical characteristics or resources of an individual such as physical capabilities, physical competences, or other abilities that require the use of physical strength or the need to apply some degree of physical effort. The evaluation of physical constructs is a measure of how architectural design of the ward environment supports the nursing staff abilities to use their physical resources. In this respect, Parker et al. (2004) suggest that the physical construct in SCEAM measures the extent to which healthcare facility spaces are physically accessible by persons of all abilities including wheelchair users. Furthermore, in the use of MEAP, Moos and Lemke (1980) suggested that a measure of the physical construct would cover the extent to which the ward environment offers physical amenities to support nurses while undertaking nursing tasks.

There is an overall consensus among the interviewed nurses that the ward nurse role is physically demanding. One of the most complex tasks that nurses perform that has a high number of subtasks is moving and handling (Please see Table 5.8, task code: TM06). The Health and Safety Executive defines manual handling operations (moving and handling) as "…any transporting or supporting of a load (including the lifting, putting down, pushing, pulling, carrying, or moving thereof) by hand or by bodily force" (HSE, 1992b, p. 10). The complexity of nursing tasks may thus be exacerbated by the task requiring any or all of the aforementioned actions defined by HSE. Beyond the complexity of a nursing task, there is a need to explore what elements of the ward would be the most relevant with respect to moving and handling tasks; i.e. where is the task type most likely to be performed? Further, what attributes the ward element should possess in order to support the nursing task requires assessment. For example, while some participants claim that there is a 'no-lift' policy within the studied NHS Trust (P17, Q14, L100), other participants do suggest that some moving and handling tasks can only be performed through physical effort (P13, Q14, L67). The following quotes do substantiate these claims:

> *"…We cannot lift the patients nowadays, which is the protocol of the Trust." (P17, Q14, L100).*
>
> *"…And may be if they want, keep the patient laid on their side, so they have all the relief of the back of the body. It is demanding because that's the moving and handling that does not require any equipment to use…" (P13, Q14, L67).*

The claim that the Trust has a 'no-lift' policy is in agreement with a regulatory requirement, The Manual Handling Operations Regulations 1992, which stipulates that "…each employer shall, so far as reasonably practicable, avoid the need for his employees, to undertake any manual operations at work which involves a risk of them being injured" (HSE, 1992b, p. 14).

The point that participant P17 was trying to make here is that according to the policy of the Trust, nursing staff members are not allowed to lift patients. However, participant P13 noted that certain types of tasks could only be performed by exerting physical effort, such as rolling patients on their side in bed. This type of task, it was suggested, could only be performed by the nurses using their bodily weight and by working collaboratively in teams. The claim made by participant P13 is reverberated in literature as Nelson and Baptiste (2004) also contend that repositioning a patient in bed (a task literarily commensurate with rolling a patient on their side to give them pressure relief) is a task that is associated with an increased risk of back injury due to high spinal loads. Participant P17, in a different context, however, agreed that even with the provision of electronic beds, which allows the nursing staff to move the patient into certain positions, some degree of physical effort would still be required (P17, Q13, L98):

> *"...well all the beds now are not like years ago when we had to climb the bed. They are all electronic now. But even though they are electronic we still do have to do some moving and handling, to get them in a comfortable position really" (P17, Q13, L98).*

If one assumes that the task of rolling a patient on their side in bed is performed in the patient bay, the question then is how much bedside space allowance is at the disposal of nurses undertaking this task? It may be evident that without the possibility to use equipment such as hoist or slide sheet to roll a patient on their side on their bed, the sufficiency and adequacy of the bedside space becomes very crucial, as the nursing staff must maintain a stable postural position for the task to be safely performed. This argument is supported by an NHS Wales (2005, p. 31) report, which proposes that a minimum of "3.60 metre (width) by 3.7 metre (depth)" is needed in order to carry out most bedside nursing tasks and to ensure that patient care in the bedside area can be performed without putting either the patient or the nursing staff at risk of injury. Space adequacy must thus be matched with task complexity.

6.6.2 Cognitive Construct

The cognitive construct consists of the mental faculty or resources of an individual to deal with environmental demands. Beyond the physicality of the nursing role on hospital wards, the profession places a significant amount of cognitive pressure on nurses. Ward nurses have to concentrate on multiple tasks and make appropriate judgement on the order of accomplishment, if necessary, between competing activities (Hall et al., 2010). Reduced concentration of nursing staff can have an adverse impact on patient-nurse interactions on hospital wards. MEAP has been used to assess the extent to which the physical environment offers orientation aid (Moos and Lemke, 1980), while PEAP was used to establish how spatial awareness is supported by the physical architectural design features of the SCU environment (Lawton et al., 2000). In the development of the Ward Environment Assessment Tool, participants were probed to narrate instances when their cognitive resources have been put under extreme test, due to the job and/or environmental demands. It must however, be appreciated that admitting cognitive stress due to challenges posed by the job demands is in itself a challenge for ward nurses, as such an admission may be seen as a sign of weakness or lack of professional competence to perform their duties.

Participants nonetheless gave examples of situations whereby their cognitive construct was severely affected by the demands of the job. It was suggested that the impacts these nursing task situations have on ward nurses might affect their abilities to perform their duties at the required standard; the extent of this severity however, may not be readily apparent. The following paragraphs highlight four different areas or instances when nurse's cognitive resources would be put under severe pressure within the case study NHS hospital wards. These instances are illustrative of the potential problems nurses might be facing and how a relevant assessment tool may help identify these problem areas. The four areas are (i) medication; (ii) memory; (iii) noise; and (iv) human factors.

6.6.2.1 Medication

The administration of medication is probably one of the most complex tasks nurses perform and has the highest risks for adverse patient outcome. As suggested by Anderson and Webster (2001, p. 34), "…administering medication is probably the highest-risk task a nurse can perform, and accidents can lead to devastating consequences for the patients and the nurse' career". For example, participant P14 below claims that the need to calculate appropriate dosage of intravenous (IV) medication is cognitively demanding for nurses.

> *"…It is cognitively demanding when you are preparing medication, especially with IV fluid. You have to think a lot about the medication. There are a lot of medications that need calculation because the range depends on the weight of the patient. Or maybe the doctor prescribes specific dosage, and in the ampulla there is another dosage. So you have to ensure the syringe measure is proportional. So you have to concentrate very well. This is important..." (P14, Q10, L38).*

While medication error has been attributed to both individual circumstances (Jones, 2009) as well as a result of systemic error (Leape et al., 1995), the extent to which the contribution made by the physical environment to support the medication process has received very little research attention. A study by Liu et al. (2014) that explored the effects of the physical environments in medical wards on medication communication processes found that nurses adapt their behaviours to the ward environment due to spatial constraints when preparing medications. Liu et al.'s (2014) study, for example, found that nurses would conduct administrative tasks related to medication on patient bed or bedside, thereby encroaching on patient privacy. In addition, by undertaking certain cognitively demanding tasks in an open space, where nurses are exposed to interruption from patients, visitor and other health professionals, nurses run the risk of committing medication errors. The finding of this study suggests that the design of the hospital ward layout may purposively be used to influence nursing staff behaviours in order to achieve positive outcomes.

6.6.2.2 Noise

Noise has been identified as a disruptive factor in the patient healing process as it could cause sleep deprivation to patients, which is essential for rejuvenation and recovery (Fillary et al., 2015). In a study conducted to explore environmental satisfaction and dissatisfaction among inpatients, Harris et al. (2002) distinguished three dimensions of the physical environment: architectural features, interior design features and ambient features. The architectural features are concerned with permanent characteristics of the built environment, such as the spatial layout of the hospital ward, patient room size or the placement of windows. The interior design features define the less permanent elements such as furnishings, colour or decorations. The ambient features comprise noise levels, odours and temperature. Harris et al. (2002) claim that extreme ambient environmental conditions may result in stress for patients and nursing staff, especially if these were "unpredictable and uncontrollable" (p. 1278). The study concluded that design features that offer greater control over the ambient environment (such as single room occupancy to reduce noise intrusion, individual thermostats and light dimmer switches) might enhance patient satisfaction of the hospital environment.

One of the greatest impediments to concentration in a hospital ward is noise and conflicting sounds from people and equipment. Some of the nurse participants in this study are of the opinion that their concentration levels are impeded in a noisy environment, as noted by participant P12 as follows:

> *"Occasionally, if it is particularly noisy, then I struggle concentrating on things. I find I struggle if I am trying to write something and someone comes and talk to me about something else. I can't do both." (P12, Q22, L90).*

It was also suggested that nurses may adopt a typical coping strategy in a noisy environment by 'numbing' their auditory senses, so they may be less receptive to these environmental noises, as indicated by participant P4 below. The numbing of the senses, however, may have spill over adverse effects on other areas of the nursing practice.

> *"But there are all sorts of alarms and beeps and things going on from various machines and sometimes it turns into a bit of a jungle in your mind and you*

don't respond to things as quickly as you should when there's loads of noise going on." (P4, Q21, L76).

The legislative instrument that regulates workers' exposure to noise hazards in the UK is 'The Control of Noise at Work Regulation 2005', which stipulates that employers should assess the risk to health and safety created by exposure to noise in the workplace and recommends that necessary adjustments be implemented in order to eliminate or reduce noise to as low a level as practicably possible (legislation.gov.uk, 2005). According to the World Health Organisation, the equivalent sound level in a hospital ward should not exceed 35dB(A) for background noise and individual noise events exceeding 45dB(A) should be avoided (World Health Organization, 1999). This WHO guidelines asserts that noise measures should be undertaken by considering other conjugating factors such as the maximum values of noise fluctuations, a measure of the number of noise events, and reverberation time for indoor noise sources (World Health Organization, 1999, p. 64). Christensen (2005) undertook a review of the noise levels in UK hospital wards and showed that these thresholds were consistently exceeded. Studies have shown that the noise level in a hospital ward environment is increased as staffing levels increase (Solet et al., 2010). However, the cause-effect relationship of this association is ambivalent and has not been conclusively researched. What can be ascertained at this stage is that noise affects cognition and the impacts of noise intrusion can and should be eliminated or reduced through design as much as practically possible. For instance, a study conducted by Hagerman et al. (2005) to understand the effect of noise absorbing ceiling tiles on patients admitted to coronary care unit found that the rate of rehospitalisation of patients in the acoustically augmented ceiling tiles rooms was significantly lower compared to patients who were treated under a bad acoustic environment.

6.6.2.3 Memory

A large body of literature has investigated the correlation between age and deteriorating memory (McDougall, 1998, Bolla et al., 1991, Bourgeois et al., 2001). The complex nature of the nursing role lends itself to intense cognitive functioning (Potter et al., 2005). Proper cognitive functioning is a prerequisite for good memory, which is an essential part of ward nursing. However, cognitive failure has been found to adversely affect memory. Cognitive failure is defined as the mistakes in everyday tasks, which a person is otherwise, capable of doing, provided they have the abilities and knowledge to perform such tasks (Elfering et al., 2011). Some of the participants in this study confirmed a direct relationship between age and diminished memory functioning. For example participant P4 below, suggested that at 57 the acuity of his/her memory has decreased over time. Older nurses may thus be experiencing episodes of forgetfulness in their job role as they age.

> *"You have got to have the mind of the places at the same time. Keep a lot of stuff to memory. And I would be very honest. I am fifty-seven now. My memory is not as good as it used to be and it gets more difficult. And I am getting more forgetful than I used to be when I was like in my thirties when I first started my nursing career." (P4, Q10, L49).*

Furthermore, the vast amount of information nurses have to process in the course of their duties may be putting undue stress on their cognitive functioning, with negative outcomes on their memory. For instance, participant P13 suggests that unless adequate environmental cues, such as the possibility of instant note taking and documentation are employed in the nursing practice process, vital information would be lost, with negative outcomes for patients:

> *"Sometimes it is very stressful and mentally draining having to like think of all the information and remember everything. If you think of something and you don't write it down, then in ten minutes, you've forgotten, because there is so much in your mind." (P13, Q10, L47).*

What can be deduced from the observation of participant P13 here is that the design of the physical workplace may be used to reduce the risks that may be due to diminished memory functioning. Environmental designers must anticipate the potential of this source of risk and thus ensure that adequate space is provided to support nurses in their duties. Following on from Harris et al. (2002) example of the triple-level design features (i.e. architectural, interior design and ambient), it may be suggested that for the physical design of the ward environment to offer appropriate support to nurses, provision of environmental cues must be conceptualised at the design stage through more permanent architectural features, such as adequate space and layout. This must then be followed up and facilitated on the ambient level, where notes and organisational schedule planner are installed at the nurse station, to decrease nurses' dependency on their memory. The need to provide environmental cues to support nurses' memory is underpinned by the routine record-keeping and documentation protocol of the nursing profession (Allen, 1998).

6.6.2.4 Human Factors

Another important aspect of cognitive constructs identified in the interviews, which interplays with the physical ward environment, is that of the personal circumstances of the ward nurses. In the context of this study, the human factor entails the personal circumstances or state of mind of the ward nurses vis-à-vis their practice environment. People's state of mind and their mental health status impacts on their job performance (Schulz et al., 2011). A person's state of mind, while it varies over time, is not always discernable in any cultural, social or environmental setting. According to Reason (2000, p. 769), "We cannot change the human condition, but we can change the condition in which humans work". This anecdote is from a study in which Reason (2000) distinguishes between the person approach and the system approach to evaluating and understanding human errors in healthcare settings. In his study, Reason argued that traditionally, organisations tend to view human error problems from the person approach perspective; i.e. as a consequence of unsafe acts of individuals, who have fallen victim of "…aberrant mental processes such as forgetfulness, inattention, poor motivation, carelessness, negligence, and recklessness…" (Reason, 2000, p. 768).

Remedies to human errors, following the person approach have, therefore, culturally embraced a philosophy that applies measures such as naming, blaming, shaming and disciplinary actions. The system approach philosophy, on the other hand, sees human errors as consequences and not causes. The system approach appreciates, acknowledges and accommodates human errors as inevitable. Remedial solutions are therefore focussed on the system, by ensuring the environment eliminates or reduces the risk of human error. Reason (2000) claims that for human errors in the workplace to occur, it is usually a consequence of the simultaneous interaction of two factors; these are the "active failures" of the individuals that commit the errors and the "latent conditions" of the system that has failed to safeguard against the error. Some of the interview respondents admitted that, something going on in their personal lives might trigger an adverse event in the hospital ward. As suggested by participant P17 below, it was conceded that human errors would always occur, no matter how intact the system is.

> *"Just occasionally, you'll get somebody that might come to work and they make an error, because of something in their personal life is happening and they're just not concentrating. Because no matter what risk assessment you put in place we are not robots… But what we say for that is... what the Trust promotes is that we learn from mistakes. So that when something does go wrong, we all look at it, discuss it and avoid it next time." (P17, Q23, L132).*

The important thing is to learn from the mistakes and to avoid them occurring in the future. However, this paradigm shift might not be easy to make as NHS has in the past been criticised for being slow to learn from its mistakes (Department of Health, 2000). There is research evidence that human errors may be eliminated through design (Chaudhury et al., 2009). However, this requires a system approach to design that embeds ergonomic and human factor principles in the design of work and workplace (Buckle et al., 2006).

6.6.3 Sensory Construct

The sensory constructs of the nursing profession are essentially the application of the five senses; namely, visual, auditory, tactile, olfactory, and taste. These are the senses that nurses may use in the course of their duties. Due to the nature of the nursing job role, diminished capabilities in any of the five senses may result in "work instability". Work instability is defined as the "…mismatch among functional (in)capacity, work demands, and its potential impacts on efficiency any productivity at work" (Gilworth et al., 2007, p. 543). The sustained prevalence of work instability in a nurse has been attributed to the potential intention to exit the profession (Letvak, 2005). EVOLVE has been used to assess the suitability of housing for persons with visual impairment, which is an indication that WEAT may also be used in similar context (Lewis et al., 2010). A study conducted in the United States to explore the perceptions and characteristics of registered nurses with sensory disabilities and risks of leaving their job, found that nurses reported hiding their disabilities during the recruitment process (Neal-Boylan et al., 2011). Recruiters in the same study did confirm that they did not remember recruiting any nurses with sensory disabilities. However, once employed, nurses must come to terms with the discrepancy between the expectation of the nursing role and their own capabilities.

The overall response to questions in the investigative interviews probing for sensory constructs can be summarised into three themes. First, participants showed a consensual agreement that the visual, the hearing and the tactile senses are the most frequently used on hospital wards by nurses. For example, there are three different accounts of participants suggesting the importance of these three senses. Participants P3, P7 and P8 each reported an example of the application of the each of the three senses.

*“**Sight** is obviously everything, isn't it? You can walk into a patient room, just look at them and you can notice straightaway if something is not right about that patient.” (P3, Q12, L32).*

*“Sometimes someone might be shouting for help somewhere. So you need to be able to **hear** that, I would hope…” (P7, Q12, L53).*

*“**Touching** is important to reassure the patient first. Then to check the wounds, we have to check the capillary refill of the breast especially, because we can have problems with that.” (P8, Q12, L80).*

Secondly, and even more importantly, the simultaneous application of these senses on one or more tasks is what places a high demand on ward nurses. Multitasking, task interruption, task suspension and the dilemma surrounding them require the intense application of more than one sense. Participants P1 and P2 suggest as follows:

“You are constantly observing patients, even if you are walking past, you are observing them... are they ok, are they asleep, are they well? So you are constantly aware of that all the time.” (P1, Q12, L46).

“Because you're listening, aren't you, even if you are not looking. I mean I can be stood in the office in a handover and I am still listening to what's going on on the ward. And you have to be like that. Because you can't be everywhere, can you.“ (P2, Q12, L102).

These accounts do suggest, for example, that the design of the ward environment must consider facilitating good hearing, while minimising noise intrusion. The assessment of the ward environment must attempt to identify those architectural design features that serve this dual purpose.

Thirdly, participants reemphasised one of the key aspects of the nursing tasks on a hospital ward, which is walking. As discussed in Chapter 6, walking is a unilateral nursing task. However, it is greatly influenced by two architectural design features of a ward; namely the visibility of the patient bays from the nurse station and the layout of the ward. As illustrated in Section 6.5 above, a simple configuration of a hospital ward layout with respect to nursing tasks contains three ward elements, namely, the nurse station, the patient bay and the corridor or circulation areas. This point is reinforced by participant P15 below, who suggest that because of the nightingale style design of the ward, nurses’ need to walk is significantly reduced, which is good for the nurses, and according to the respondent, is good for the patient too, because the patients are reassured if they can see the nurses. The second part of this claim regarding the layout, however, can be contested, as patient privacy might be compromised in such a setting.

“Because of the layout of the ward, a nightingale ward, so you can see every single patient, without necessarily having to move from one area, so you can see if the patient is in pain. You can see if the patient needs help, if a patient is sleeping. You can just walk down the ward and see everybody at once and they all know where you are going to be. So I don't have a problem with the layout.” (P15, Q17, L116).

Walking is an indispensable part of the nursing role. While walking is essentially a unilateral task, and therefore may be presumed a nursing task of lower complexity, it will most inevitably be conducted in conjunction with other tasks. When ward nurses undertake walking in isolation, it may be seen as a redundant and unproductive task, which may create a sense of frustration in those nurses. In order to reduce this sense of frustration, nurses may either prefer to do without walking altogether (which may increase the risk of adverse effects for patients), or replace walking with other tasks or by other means, in order to achieve deliberate and positive outcomes. Some studies do suggest that nurses may walk up to 12 miles per shift due to the layout of the ward (Fitzgerald, 2007). While time spent walking, if saved, can translate into time spent providing therapeutic care for patients (Zimring et al., 2004), other studies have established a correlation between patient visibility and the time ward nurses spend walking and the distance travelled (Lu and Zimring, 2012), suggesting that better patient visibility from the central nurse station reduces time nurses spend walking. The spatial layout of the ward unit has also been found to affect nurses' walking and team collaboration (Lu, 2010). For instance, wards with radial layout, i.e. with the nurse station located at the centre of the unit and the patient bays 'radiating' from this central position are said to increase patient visibility from nurse stations and, consequently, reduce nurse walking on ward. The so-called racetrack ward designs, on the other hand, are subjects of criticism due to their inability to afford the same level of patient visibility. The assessment of the hospital ward for its adequacy to support nursing staff in the sensory construct, should therefore, demonstrate the significance of these relationships.

6.6.4 Universal Construct

In the context of this research, the universal constructs refer to those basic aspects of the nursing role that are deemed important as identified earlier in this research study, which, however, did not fit into the physical, cognitive and sensory constructs. For example, the risk of clinical error, the effects of team collaboration, pace of work and work environment related factors more pertinent to older nurses that have been highlighted as challenging by ward nurses in the context of their role in Chapter 5. In this respect, with regard to the reviewed assessment tools, Sloane et al. (2002) suggest that TESS-NH can be used to discern the extent to which the SCU environment supports the physical health and safety of older people with dementia. The evaluation of universal constructs may also entail the basic needs of a nurse coming in contact with the physical environment. This may include cultural values such as privacy and dignity, and how the ward environment supports nurses in fulfilling these needs, which are essential in the order for nurses to perform their duties up to the expected professional standards. The Department of Health (2010) has a set of guidelines called 'Essence of Care' to support the patient healing process, such as in areas of respect, privacy, dignity and the use of space. Although extensive research has been carried out on patient privacy and dignity (Woogara, 2005, Baillie, 2009), there is still no single standard or legislation that offers guidelines to the privacy and dignity of the nursing practice, and how these may be supported by the design of the nursing practice environment. As suggested by P18 below, nurses do struggle to find suitable spaces to discuss confidential patient issues either in person with patients, directly and/or on the telephone in consultation with other multidisciplinary teams. The lack of adequate space to interact with patients suggests patient privacy and dignity may not always be of priority in the patient-nurse interaction.

> *"So I think we should always have somewhere where you can take patients and speak to them privately or somewhere where if you need to make phone*

> *calls, you don't want people overhearing while you're discussing other patients, because we are just in a compact space". (P18, Q23, L126).*

Furthermore, nurses have cited the lack of understanding patient perception of dignity and pressures due to job demands, such as the pace of work, as the main reasons why patient dignity has been compromised (Walsh and Kowanko, 2002, p. 144). This lack of latitude over the work environment, on the other hand, has been related to be a source of stress for nurses (Karasek and Theorell, 1990, Bourbonnais et al., 1998).

While one may presume that adherence to the best practices prescribed by the Department of Health (2010) with respect to the support of patient privacy and dignity, would translate to the same positive outcomes for practising nurses, there is still a dearth in research evidence to substantiate this. Hence, the need for a dignified nursing practice environment cannot be overemphasised. A dignified nursing practice environment is the basic premise for professionalism or professional identity, which are the values and beliefs of the nurse and, thus, may translate into positive or adverse actions or interaction for patients (Fagermoen, 1997). Following this trail of thought, one may deduce that nurses practising in a deprived environment with regard their own respect, privacy and dignity, may not be in a position to support patient needs for such values. There is evidence to substantiate the claim that nurses' dignity may be compromised within the NHS, as suggested by P2, who noted that the confidentiality of personal issues is a prevalent problem within the Trust:

> *I don't feel there's professionalism anymore. In the past, if you did go to a staff nurse or a sister and you say look I have got this problem. It wouldn't matter what their personal feelings were on that problem, they will go into them in their role, because they had that defined role. And they would support you and help you and that problem would stay confidential. Whereas now we don't have that kind of perking order anymore. (P2, Q9, L78).*

While this claim itself has not been directly linked to inadequate design of the ward environment, the supposition that a suboptimal nursing practice environment would eventually result in adverse patient outcomes is more than mere conjecture. Further research is needed to establish an unequivocal cause-effect relationship.

An objective measure of the adequacy of the ward element to support the nurses in these four personal constructs is therefore necessary to create a conducive environment for nursing practice and therefore an age-friendly work environment within the NHS. The following sections thus present the methodical approach to developing a Ward Environment Assessment Tool. It demonstrates the process by which the various architectural design features were constructed in the WEAT tool. As indicated earlier in this chapter, WEAT is a diagnostic tool and not a set of design standards or guidelines. The architectural design features in WEAT were gleaned from existing literature resources and standards that have proven to support best practice design approaches in the healthcare sector in the UK and internationally.

6.7 Development of WEAT Checklist

WEAT is a measure of the adequacy of the ward elements to support nurses in the course of their duties by ameliorating the impacts of the physical environment on nurses in the four constructs, namely physical, cognitive, sensory and universal. This is achieved by using the WEAT checklist to assess the fine implementation of a set of carefully selected architectural design features according to evidence-based design standards and guidelines. More than 700 architectural design features have been identified, which were obtained from various literature resources. These were then investigated in the 14 ward elements presented in section 6.5. Some architectural design features are applicable in more than one ward element; hence they have been used wherever they are deemed relevant. Each ward element is allocated a cluster of architectural design features in each of the four constructs. Each design feature is rated as present (1) or absent (0) or not applicable (n/a) in the ward element. The sum of the ratings in each construct represents the adequacy of the ward in that particular construct. The adequacy measure of a ward element is expressed in the Personal Constructs Impact (PCI) score, which is the aggregate score of the ward element in each of the four constructs, expressed as a percentage of the sum of architectural design features used in the post-occupancy evaluation. Whereas the higher the PCI score the better support the ward element is expected to be offering ward nurses, caution should be applied not to make premature judgement on the adequacy of a ward element being assessed to exhibit a high or low PCI score. The attainment of a high or a low PCI score in itself does not necessarily indicate how well-designed a ward element is; rather the PCI score should be seen in context, i.e. one ward element's PCI score in a given hospital ward, may be compared to that of a similar ward element in another ward. Therefore, the focus of the implementation of the WEAT checklist is to identify problem areas that might need attention.

An extract of WEAT checklist is presented in Table 6.3. Each ward element is coded as WE01, WE02, WE03,…WE14. In the example given in Table 6.3, the nurse station is coded WE01. Twelve architectural design features were assessed across the four constructs (physical, cognitive, sensory and universal). The nurse station was rated to have exhibited nine of these 12 architectural design features; hence it was awarded a PCI score of 75% (i.e. nine as a percentage of 12). An acceptable PCI score may thus be subject to management decision, based on the needs and expectation of the hospital. The WEAT checklist makes provision for a remark column where the assessor may note observations that could not be resolved on site and which might require further investigation, and therefore affect judgment on the adequacy of a ward element that may not be quantifiable within the PCI computation in the WEAT checklist.

Whereas the use of more than 700 architectural design features to assess ward elements in a hospital offers a robust quantitative dimension to this study, the results of this quantitative dimension are analysed and expressed qualitatively, as will be demonstrated in Chapter 7. This 'quasi' mixed methods approached improves the rigour of the study. To aid this qualitative evaluation of the quantitative data obtained from the WEAT checklist, a rating scheme has been created, consisting of four categories, depending on the PCI score attained by a ward element:

Category 1: 75% and above – Excellent
Category 2: up to 65% and below 75% – Good
Category 3: up to 55% and below 65% – Adequate
Category 4: Less than 55% – Suboptimal

These categories have been determined arbitrarily, to aid the comparison of the ward elements within a ward and across several wards. Management of healthcare facilities may choose to apply other thresholds to conduct comparative analysis based on the local setting. In the 'assumptions' made in this thesis, a ward element that attains a PCI score of 75% and above may be deemed to be an excellent 'performer' to functionally support nurses in their job role, in the designated tasks, for which the ward elements are designed. However, since WEAT is a prelude to the development of the NTEA Framework, not all ward elements would be equally important in their functional fit with respect to each of the nursing tasks presented in Chapter 5. As will be demonstrated in the Chapter 8, a PCI score below 55% might be a warning signal and should draw the attention of the assessor to the fact that the design of that space may not be fully supportive of its user.

If a design feature is rated not applicable (n/a), then that design feature does not form part of the overall calculation of the PCI score for the particular ward element, as this would skew the overall PCI score of the ward element. It is presumed that for a set of architectural design features to be accepted as actually measuring the adequacy of a hospital ward element, it must have retained at least two-third of the original set of architectural design features allocated for the measurement of that particular ward element. In the example shown in Table 6.3, if the ward element (WE01) having a set of 12 architectural design features in total, out of which six were found to be 'not applicable' (i.e. marked n/a), then such post-occupancy evaluation would not provide a reliable PCI score, as only 50% of the original set of architectural design features were used. Hence, for the set of architectural design features to be fit for purpose, at least eight (making two-third of the original 12) must have been retained and rated as present (1) or absent (0). By using the WEAT checklist to evaluate a hospital ward, it can be demonstrated how or to what extent the ward element adequately supports nursing tasks.

As discussed in Chapter 5, nursing tasks have demands qualities expressed in their level of complexity. The complexity level of nursing tasks is expressed in the form of the patient-nurse interaction, which manifests in three domains, namely care, surveillance or support. It is important to note that the PCI score is an evaluation of the adequacy of each of the ward elements to functionally support nurses in performing these nursing tasks.

6.8 Validation of WEAT

The fifth and last stage of the development of WEAT is to establish if it is fit for purpose. The ultimate goal of the validation process is to reduce subjectivity and add rigour to the study. Hence, the validation of WEAT was embedded in the development process itself. In the first instance, a literature review has established the use of some of the architectural design features to measure construct attributes in similar settings (Parker et al., 2004, Sloane et al., 2002). Furthermore, measure of some of the rating items was objective, such as the lighting level, the noise level, temperature or spatial dimensions. However, validation still required the objective contribution of an independent party. Hence, the tool was presented to one of the facilities managers at the case Hospital Trust, whose views were sought regarding the relevance of the compiled features and the criteria against which these were being measured.

It is important to reiterate that WEAT is a diagnostic tool that can be used to establish the adequacy of the hospital wards for nurses. The architectural design features compiled for the WEAT checklist have been generated from applicable standards, design guidelines, and best practices, such as the 'Health Building Notes' by the UK Department of Health (2014); the 'Inclusive Design Toolkit' by University of Cambridge (2015); and the 'Accessibility for the Disabled: A Design Manual for a Barrier Free Environment' manual by the United Nations (2003). Further sources are evidence-based research results such as Multiphasic Environment Assessment Procedure (Moos and Lemke, 1980); Professional Environment Assessment Procedure (Lawton et al., 2000); Therapeutic Environmental Screening Survey for Nursing Homes (Sloane et al., 2002); Sheffield Care Environment Assessment Matrix (Parker et al., 2004); and Evaluation of Older People's Living Environments (Lewis et al., 2010). Finally, the issues raised by the interviewed nurses were also incorporated in the WEAT checklist.

While the architectural design features have been meticulously compiled from credible sources, it was necessary to independently establish how relevant these would be for the case study hospital in question. This is particularly important as it must be understood that some of the highlighted problems are the subjective opinions of individual nurses. However, a facilities manager from the same NHS Trust would be in a better position to give a different perspective to these opinions. This approach was adopted for two reasons. First, the facilities manager that acted as validator was not a participant in the investigative interviews, hence his opinions had not been incorporated in the tool. He could be presumed an independent outsider in the validation process. Secondly, the choice of a validator completely 'independent' was discarded because the knowledge of the case study environment was vital in the validation process. While there are standards and regulations that NHS Trusts must adhere to, each Trust has its own internal decision latitude to adapt these to local circumstances.

TABLE 6.3: Extract from Ward Environment Assessment Tool

WARD ELEMENT CODE	PERSONAL CONSTRUCTS	WARD ELEMENT	NUMBER OF DESIGN FEATURE	RATING: Present (1) Absent (0) Not Applicable (n/a)	PCI SCORE	DESIGN FEATURE DESCRIPTION	REMARKS
WE01	sensory	nurse station	1	1		in case of more than one nurse station, each patient bay visible from at least one nurse station	
	sensory	nurse station	2	1		ambient lighting fitted on desktop	
	sensory	nurse station	3	1		computer keyboard free of glare and reflection	
	universal	nurse station	4	1		staff WC separate from patients' and visitors' facilities	
	universal	nurse station	5	0		staff WC offers gender choices	
	physical	nurse station	6	1		at least two nursing computer workstations with ergonomic seating	
	universal	nurse station	7	1		accommodates at least two further nursing staff sitting to facilitate team collaboration and short meetings	
	physical	nurse station	8	0		desktop height adjustable	
	cognitive	nurse station	9	0		tabard pinafore provided for medication rounds	
	cognitive	nurse station	10	1		equipped with adequate stationeries and writing materials for note taking	
	cognitive	nurse station	11	1		room numbers placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open	
	universal	nurse station	12	1		air quality satisfactory (not stuffy or draughty)	
			Total	**9**	**75%**		

However, the facilities manager that validated the tool was one of the managers that participated in the exploratory interviews presented in Chapter 4. Being in a managerial position, the validator was aware of the interconnectivity of employee expectations, NHS guidelines, and the peculiarities of the case study Trust. The validation process took the form of a face-to-face interview that lasted about 80 minutes. Prior to the interview, the researcher had highlighted those architectural design features that were deemed to be of concern. For example, some participants in the investigative interviews showed a preference for one centralised nurse station at the centre of the ward. While it was acknowledged that this is a desirable design initiative, the facilities manager noted that future design endeavour would take the treatment to the patient through what is called ‘mobile nurse stations’. Some of the wards are already equipped with these mobile nurse stations (Figure 6.6).

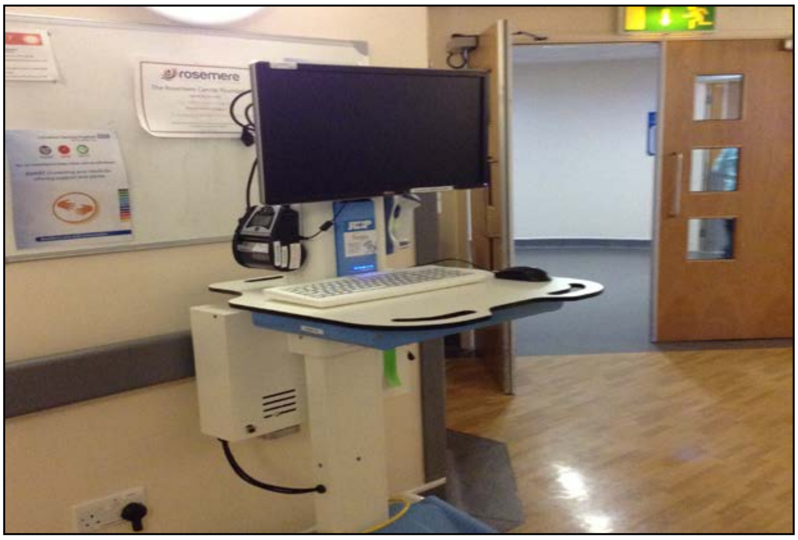


FIGURE 6.6: Example of a Mobile Nurse Station

Essentially, these are computerised workstations that are capable of performing medical observations on patients and recording the results instantly, without the need to either move the patient or perform a follow-up documentation by the nurse at the nurse station. So item-by-item, each of the highlighted architectural design features was discussed, and resolved. The facilities manager also drew the attention of the researcher to further literature, such as the Health Building Notes’ by the UK Department of Health (2014), from which relevant information may be sourced. The resultant tool is known as WEAT, which can be used to perform post-occupancy evaluation of hospital wards and thereby establish their suitability for nursing tasks.

Each of the ward elements can be assessed in its suitability to support nurses in the nursing tasks discussed in Section 5.4.3. While WEAT has been developed to offer support in the accomplishment of the ultimate goal of this PhD study, (i.e. the development of a framework), it may be used on a stand-alone basis to assess hospital wards. WEAT thus has the potential to contribute to the implementation of post-occupancy evaluation of hospital wards in the UK. The validation of WEAT by an insider expert provides the tool with the necessary validity to ensure subsequent uses produce consistent results. A key element of WEAT is its flexibility to be adaptable to various contexts. Design feature items that are deemed ‘not applicable’ may be omitted from the assessment process. However, the need to use at least two-third of the proposed architectural design features is recommended to ensure a significant part of the ward element has been assessed. Also, the need for a ward element to reach a PCI score of 75% increases the assessors’ confidence in the adequacy of that ward element.

6.9 Summary of Chapter 6

This chapter has presented the rationale for the development of a new instrument for the assessment of hospital wards for a particular group of users; i.e. nurses. The major components of hospital wards were identified, which are termed the ward elements. It was established that post-occupancy evaluation might be employed as a methodical approach to assess the adequacy of the various ward elements to support nurses in the course of their duties. In the absence of a suitable tool, the need and the rationale to develop a new assessment tool was demonstrated. The new tool was constructed by reviewing five environment assessment instruments used in similar settings, such as Special Care Units for persons with dementia. The new tool, named Ward Environment Assessment Tool, consists of more than 700 architectural design features across four important constructs that serve as resources for nurses in the course of their duties. The next chapter will discuss the results of the post-occupancy evaluation conducted on three of the case study hospitals, using the WEAT checklist.

CHAPTER 7: POST-OCCUPANCY EVALUATION

7.1 Introduction

This chapter presents the results of the post-occupancy evaluation survey of three of the four wards used as source of data collection for this PhD study. As discussed in Chapter 6, a thorough review of the literature did not identify a suitable environmental assessment tool that can be adopted or adapted for use to evaluate the adequacy of hospital wards to support nurses in their job roles. Hence the Ward Environment Assessment Tool (WEAT) was developed and used for the POE survey of the three case study wards. WEAT is an excel-based checklist consisting of more than 700 architectural design features covering the four important personal constructs of nurses working on hospital wards, namely, physical, cognitive, sensory, and universal constructs. The WEAT POE checklist had been compiled by reviewing design standards; regulatory requirements; industry best practices; evidence-based recommendations and guidelines; and other environment assessment instruments used in similar settings. The WEAT checklist was used to assess adequacy of the 14 ward elements to support ward nurses in these four constructs.

In Chapter 6, it was established that there are three types of POEs, namely, the indicative, the investigative and the diagnostic. A diagnostic POE attempts to marry the relationship between the objective performance of the built environment with the subjective expectation of the users. As a diagnostic tool, the WEAT POE checklist can be used to unpick design issues that are deemed to be important from the users' perspective. The experiences of ward nurses shared in Chapters 5 and 6 do suggest that more thought should be given to the design of certain aspects of the ward elements so they can meet the needs of the nursing staff. As a diagnostic tool, WEAT was used to explore the adequacy of the identified 14 ward elements in each of the three wards of the case study. The wards are named Ward A, Ward B, and Ward C, respectively.

This POE survey was conducted on the premise of attempting to identify and unpick issues that have already been raised by users, and presenting these in a systematic manner. Three sources of evidence were used in the comprehensive analysis of the ward elements. First, an objective observation of the ward elements was undertaken in form of the POE, by administering the WEAT checklist. This stage was used to measure the performance of the ward elements against the architectural design features in the WEAT POE checklist. With the aid of excel, some of the results of the POE were transformed into graphical illustrations to depict the characteristics of the ward elements. The second source was to obtain photographic evidence of these architectural design features during the POE walkthrough survey. During the POE survey, photographs were taken where appropriate, ensuring that users' data protection rights were not infringed. Thirdly, the claims and accounts given by the users were further reviewed to substantiate the first two sources of evidence. In this case the claims of the ward nurses working on the wards, using the spaces for the purpose of supporting patient therapeutic healing process. Data from these three sources were then synthesised and corroborated against literary evidence wherever applicable and possible.

7.2 Facilities Description

Three wards were surveyed in this POE study, two of which are located in Preston and one in Chorley. Essentially the justification for choosing these three wards out of the four wards from which participants were recruited, is convenience and pragmatism. The fourth ward is an ophthalmology outpatient surgery; hence it does not offer the full scope of service like a typical inpatient ward with 24-hour operation.

Within the complexity of healthcare facilities, it is important to draw a boundary line for the assessment of these hospital wards. This is because the focus of the POE study is on the evaluation of the ward elements constituting hospital wards, which are relevant to nursing tasks. However, being cognisant of the fact that a hospital ward is non-functional without the adjoining facilities, the scope of the POE study has been limited to the operation of the ward elements relevant directly to nursing activities. Since it was not feasible to explore all areas of the hospital wards within the remit of this PhD project, the post-occupancy evaluation of these three hospital wards was conducted independent of other connecting architectural spaces and medical procedures, and with the assumption that all the adjoining spaces are functioning at expected levels and standards. The POE survey therefore starts at the entrance of the ward and was conducted within the perimeter of these wards, and disregarding the conjugating factors of other spatial elements of the hospital relevant to the wards. For example, all the three wards are located on a level above the ground floor; therefore all architectural design parameters must be assessed in this context.

7.2.1 Ward A

Ward A is a surgical ward specialised in the upper gastrointestinal treatment of patients. It contains 23 patient beds and three nurse stations. Two of the nurse stations are located on the corridor, while one is situated in one of the patient bays where special care patients are treated. There are 21 trained nurses and 19 healthcare assistants (HCAs) on rota shifts on the ward. The ward layout consists of patient bays, with four to six beds (Figure 7.1). All the patient bays can be accessed from a connecting corridor that also serves as the circulating area, through which most of the movement in, out and around the ward areas can be made. Please see Appendix 7.2 for a pull out larger version of Ward A layout.

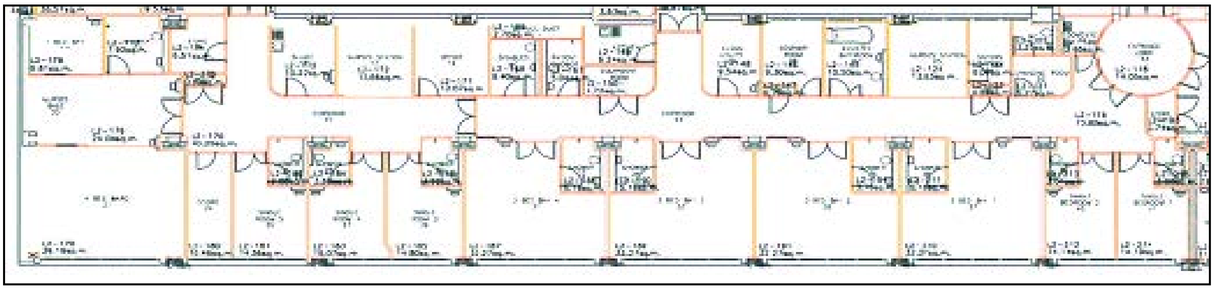


FIGURE 7.1: Ward A Layout

7.2.2 Ward B

Ward B is a surgical ward for surgical interventions and houses 20 patient beds, and it admits and treats patients undergoing breast cancer and urological surgical interventions. It is a twin ward symmetrical along the X-axis (Figure 7.2). Each of the twin ward houses two nurse stations; one in the middle of the ward, overlooking two large patient bays. The second nurse station is adjacent to a large racetrack design patient bay. While the central location of the nurse station on Ward B mimics the nightingale layout design, this ward is a bay ward with racetrack layout type patient bays. For the purpose of this study, it was the ward below the X-axis in Figure 7.2 that was selected for the POE survey. This is because the interviewed ward nurses worked on this part of the unit. This is essential to ensure continuity and so that ward nurse responses to the interviews could be correlated with the POE results. Depending on the patient turnover, between 15 and 20 ward nurses are on rota in Ward B. Please see Appendix 7.3 for a pull out larger version of Ward B layout.

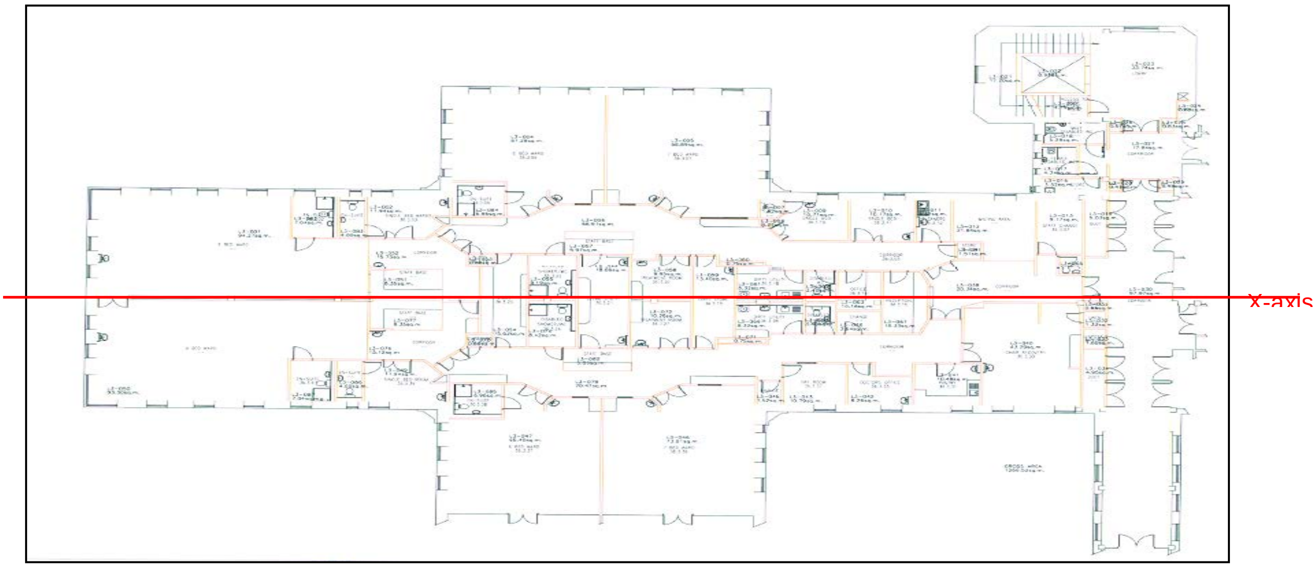


FIGURE 7.2: Ward B Layout

7.2.3 Ward C

Ward C is a gastroenterology medical ward. It has a racetrack layout with patient bays accessible from a long connecting corridor (Figure 7.3). There are 32 patient beds and 20 nurses on the ward. As a medical ward, some of the patients are long-term stay, so the patient turnover may be slower compared to the two previous wards which are surgical wards. Unlike Wards A and B, this ward does not have a dedicated nurse station. The architectural space originally designated for ward nurses is occupied by a ward clerk who undertakes administrative tasks on behalf of the nurses. Instead of a fixed nurse station, nurses on this ward work from the mobile nurse stations, which are computerised lecterns on wheels. Hence, for the purpose of this POE study, the ward clerk station was assessed if it was fit for purpose. Please see Appendix 7.4 for a pull out larger version of Ward C layout.

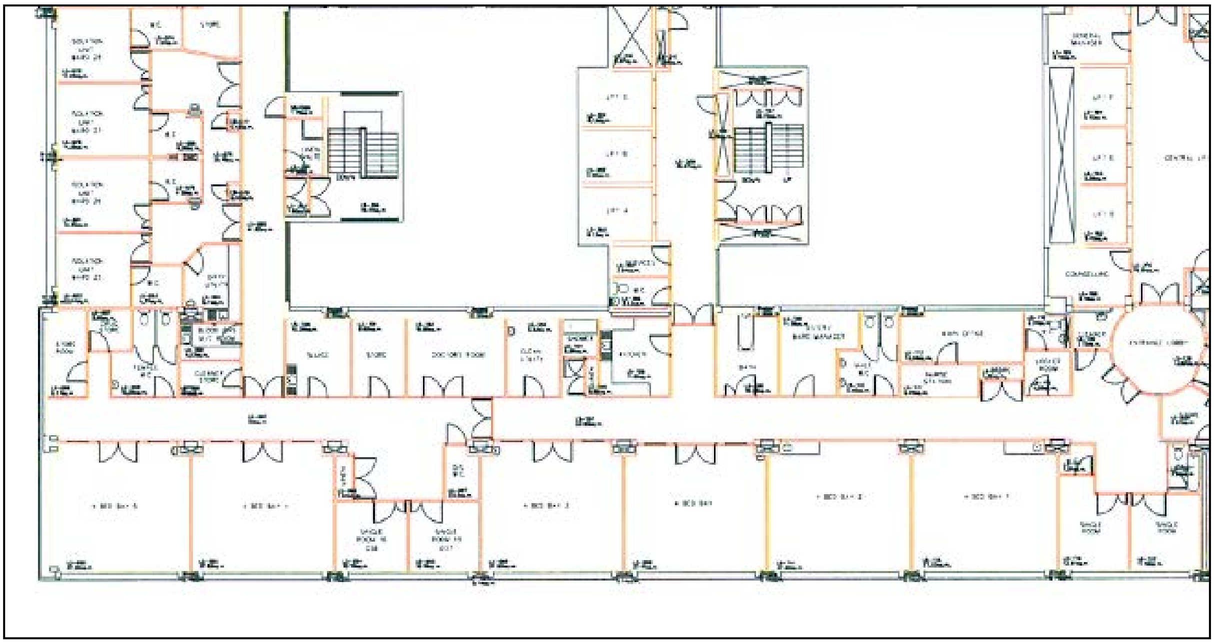


FIGURE 7.3: Ward C Layout

7.3 Preparation of Data Collection Instruments

The data collection instrument for this stage of the research consists mainly of the WEAT POE checklist. The WEAT POE checklist was discussed in details in Chapter 6. This checklist was used to rate the architectural design features of each of the ward elements. The ambient environment parameters such as sound, temperature and lighting level were measured with the aid of a multi-function Environment Meter (Figure 7.4).

PRECISION GOLD

INSTRUCTION MANUAL

MODEL: NO9AQ

Multi-Function Environment Meter

4 IN 1

SOUND LEVEL

LIGHT

HUMIDITY

TEMPERATURE

FIGURE 7.4: Photograph of Environment Meter

For spatial and structural dimensions related to length, breadth and height, a tape rule was used to obtain such measurements where necessary. Other parameters of the ward elements were obtained by visual observation of the 'presence' or 'absence' of the design feature. A design feature is rated 'not applicable' (n/a) where it was deemed not relevant to the ward elements being observed. For design features that were unforeseen, but were deemed necessary, a measurement was taken and recorded in the remarks column of the WEAT POE checklist. Such items were followed up and are either explained as part of the evaluation process or discarded if they were eventually deemed irrelevant to the study. The main objective of this stage of the project is to establish independent and corroborative evidence to assess the adequacy of the ward environment to support nurses in their duties.

7.4 Data Collection

On the day of the POE survey, the researcher visited the wards as previously agreed with the ward managers. In all cases the ward manager showed the researcher around the ward and introduced him to the members of staff and briefly explained what the survey was all about. For spaces occupied by patients such as patient bays, the researcher was requested to indicate his intention before accessing such spaces. It took approximately 6-8 hours to complete a full ward survey, consisting of all the ward elements. The data collection of the three wards used in this study was undertaken between 26 January 2016 and 3 February 2016.

As discussed in Chapter 7, the validation of the WEAT POE checklist was conducted with the facilities manager of the Lancashire Teaching Hospitals NHS Foundation Trust. This validation process helped to establish if the WEAT POE checklist would be fit for purpose or not. After the validation, the WEAT was then piloted on Ward A. The results of the pilot POE was reviewed, and it was decided at that point that given the available resources, WEAT did not require further fine tuning before being used in the final study. The results of the pilot study on Ward A were therefore incorporated as part of the final study, as another walkthrough survey could not have yielded new evidence.

As a ward would contain more than one of the 14 ward elements, for the POE study, only one of these ward elements was surveyed, which was deemed to be 'representative' of that ward element type on the ward. For example, when surveying patient bays, data was collected on only one patient bay on each ward; and not on all the patient bays. The choice of the patient bay that was surveyed was based essentially on the availability of such spaces at the time the POE walkthrough was undertaken.

To ensure a seamless data collection process, the WEAT excel spread sheet was prepared electronically on a tablet device. The 'presence' (1), 'absence' (0) or 'non-applicability' (n/a), of a design feature was recorded by selecting the right denotation in the appropriate column from a drop down list in the excel checklist. This approach reduced the risk of mistype error, as only the items from the drop down list can be selected. Also, by administering WEAT electronically, the risk of error due to data transfer from hard copy to electronic format was virtually eliminated. Nevertheless, a paper version of the WEAT checklist was always at hand to ensure the POE study could progress even in the unlikely adverse event of electronic failure.

7.5 Data Analysis

In Chapter 6, it was demonstrated that the main purpose of the ward elements is to support nurses in their job role to provide therapeutic healing for patients. Therefore, the assessment of the ward elements must be geared in the direction of this functional purpose. Also, the ward elements are expected to fulfil this objective by supporting nursing in the four personal constructs, namely physical, cognitive, sensory and universal. The analysis of the data collected must thus be conducted in a way such that the dynamics between the ward elements and the personal constructs can be adequately illuminated.

As was explained in Chapter 3, the methodological approach employed in this PhD project was that of case study. It is therefore understandable that there are no existing benchmarks against which the parameters of the ward elements measured may be compared. Also, the ultimate objective of this PhD study is to construct a framework that will support the creation of a fit between nurses' capabilities and their job and environmental demands. The case study approach is thus used to provide an empirical field of investigation, rather than attempting to establish a basis for generalisation. Hence, the PCI scores of each ward element were compared across the three wards. Then the four constructs were analysed for the ward elements across the three wards.

7.6 WEAT POE Results

Table 7.1 presents a summary of the three wards with all the 14 ward elements observed during the POE survey. As established in Chapter 6, for a ward element to be classed as exceptionally fulfilling its purpose in supporting nursing tasks, it must have attained an aggregate Personal Construct Impact (PCI) score of at least 75% of the overall ratings of the design feature items. A review of the literature did not identify an appropriate benchmark against which these PCI scores can be compared, therefore the evaluation of the ward elements will be 'within case' comparison, as this approach better describes the characteristics of these wards elements in their natural settings. However, not all the design features would be relevant in every case for the assessment of a ward element. For a PCI score to be deemed adequate, it must have applied at least two-third (i.e. 66.7%) of all the original design features intended for use in the assessment of the ward element. Otherwise, the assessment of that particular ward element would be rated invalid. It is noteworthy that at least the two-third of the original design features was applied for all the ward elements in the three wards. While this is an arbitrary selected threshold and does provide some level of confidence, it must be treated with caution. What is more important is the cumulative effects of the design features eventually used from the WEAT POE checklist.

TABLE 7.1: Individual and Average PCI Scores for the Ward Elements of the Three Wards

PCI Scores of the Case Study Hospital Wards					
Codes	**Ward Elements**	**Ward A**	**Ward B**	**Ward C**	**Average PCI**
WE01	Nurse station	79.41%	78.46%	77.27%	78.38%
WE02	Patient bay	78.05%	72.15%	78.21%	76.14%
WE03	Side room	72.62%	63.51%	67.86%	68.00%
WE04	Staff room	66.67%	74.36%	71.79%	70.94%
WE05	Ward manager's office	71.43%	77.78%	71.43%	73.54%
WE06	Doctor's office	72.73%	82.35%	74.19%	76.42%
WE07	Day room	70.18%	67.86%	45.61%	61.22%
WE08	Corridor	61.82%	60.78%	67.27%	63.29%
WE09	Storage room	51.85%	60.00%	60.00%	57.28%
WE10	Clean utility	63.64%	65.12%	64.44%	64.40%
WE11	Sluice	73.68%	85.71%	71.43%	76.94%
WE12	Bathroom & WC	74.58%	78.95%	66.07%	73.20%
WE13	Kitchen	56.25%	75.76%	82.86%	71.62%
WE14	Entrances & exits	85.00%	85.71%	82.61%	84.44%

7.6.1 Evaluating the PCI Scores

Overall, it can be seen from Table 7.1 that, of the three wards, there are two ward elements that obtained a PCI score of more than 75% in each of the three wards; namely the nurse stations and the entrances and exits. These are the only two ward elements that are performing at the higher end of adequacy levels for the three wards. Conversely, the two ward elements with the lowest PCI scores are the day room in Ward C, with 45.61% and the storage room in Ward A, with 51.85%. The average PCI scores are also denoted in Table 7.1. Figure 7.5 presents a graphical representation of the PCI scores of Wards A, B, and C. For comparison, the values of Ward A is shown on the graph. Assuming the threshold of 75% for excellent performance of a ward element, it can be seen from this graph that only a few ward elements fulfilled this criterion, such as the three nurse stations; the three entrances and exits and the patient bays in Ward A and Ward C.

Furthermore, the graphical representation of the POE results may show extreme values in some of the constructs. For instance, in cases where only a few design features have been listed to assess a personal construct, it might be relatively “easy” to fulfil all of these requirements; this will produce a result of “100%”. Conversely, where the design features had either not been provided or all the listed design features have been denoted “not applicable” for a particular construct, the score will be “0%”. A good example of the “outlier” characteristics of the datasets is shown Figure 7.9 on the cognitive constructs graph in the case of the entrances and exits (100%) and bathroom & WC (0%). The following analyses have “ignored” these instances and have focused on cases where sufficient data were collected to substantiate an unequivocal and robust stance for the research study.

It is important to reiterate that while numerical values have been used in the analysis of the results of the POE, these are indicative, and not representative. As a qualitative case study research, this approach is intended to objectify the results of the POE study and thus offer a basis of comparison across the three wards. Hence the graphical illustrations should be understood qualitatively, and not in terms of their absolute numerical values. A more nuanced approach is necessary to illuminate the individual characteristics of each ward element on its own and in comparison with the ward elements on the other wards.

7.6.2 Comparative Analyses of Personal Constructs

The following sections present the comparative analysis of the four personal constructs in each of the 14 ward elements across the three wards. This comparison is conducted by presenting graphs and photographic evidence (where available) to substantiate observations undertaken during the WEAT POE walkthrough survey. Therefore, the graphs in this section showing the comparative analysis of attained construct score of each of the 14 ward elements contains the score of each ward element after the non-applicable design features have been removed from the data sets. The ‘data cleaning’ was done in order to ensure only relevant architectural design features are taken into account when calculating the PCI score for each ward element and during the comparative analysis of the personal constructs scores. Throughout these analyses the numerical value of Ward A has been highlighted on the graphs to enhance relative comparison with the values of the other two wards.

The following analyses highlight the ward elements with the highest scores and the lowest scores in the context of their personal constructs impacts. It is important to note that it is possible for a ward element to be an embodiment of good and suboptimal examples in two or more of the personal constructs at the same time.

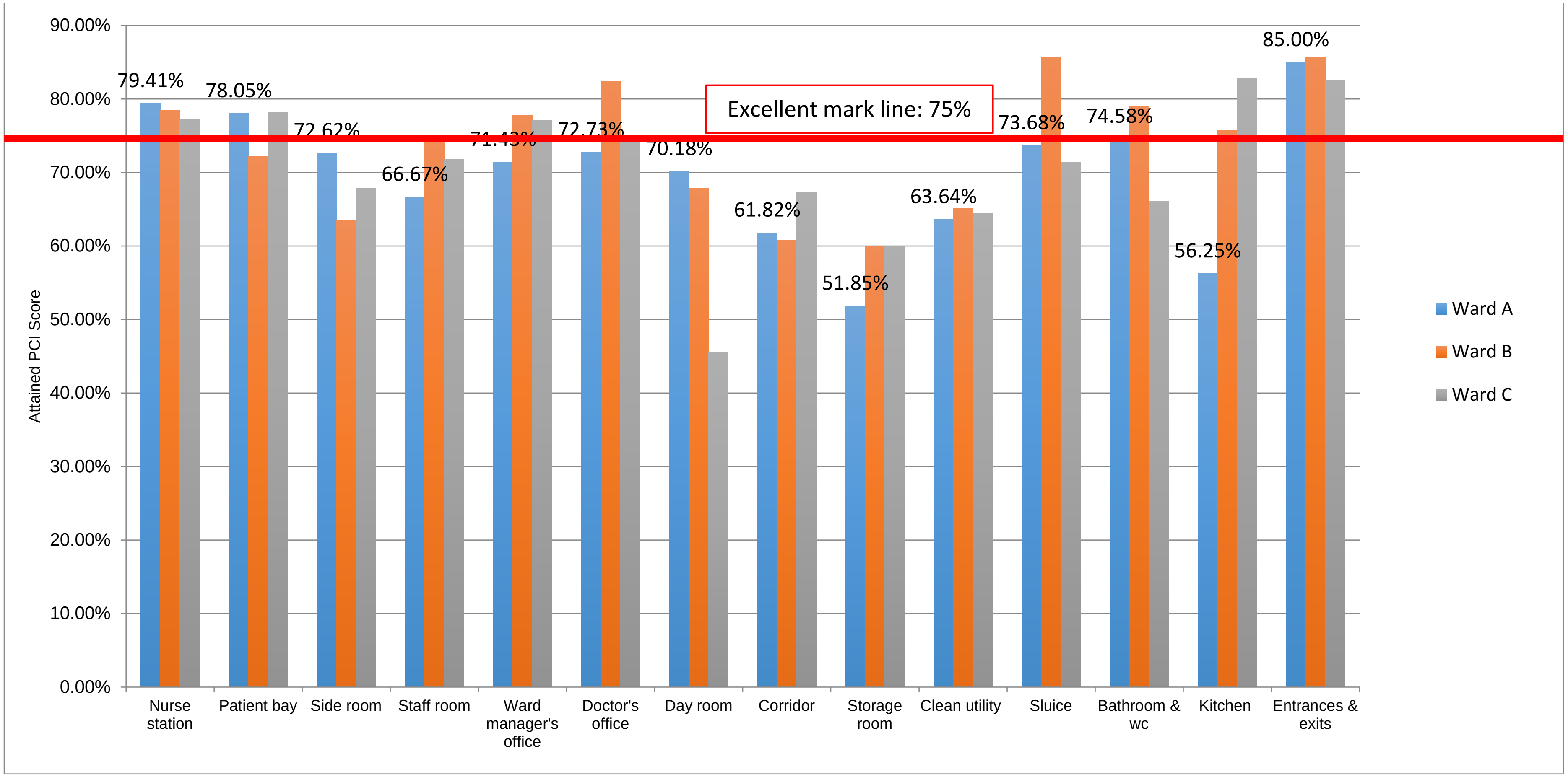


FIGURE 7.5: PCI Scores for the Three Wards

7.6.2.1 Physical Construct – Attained Constructs Score

The measure of the physical construct shows how the design of the ward elements support the physical effort exerted by ward nurses while performing nursing tasks designated to be undertaken in those ward elements. Figure 7.6 shows the attained physical construct scores for the 14 ward elements of the three wards. For example, with a physical construct score of more than 90%, the staff room in Ward C, the ward manager's office in Wards A and C, the doctor's office in Ward C and the kitchen in Ward C seem to be the highest performers in support of physical constructs of their users. As discussed in Chapter 5, one of the ward nurses' tasks is 'walking'. It was also highlighted that while walking is a unilateral task, it would most inevitably be performed along with other tasks or between one task and the other. As a result of this multitasking nature related to walking, ward nurses are more than likely to be carrying or holding an object in their hands when walking from one ward element to the other. This means that one or both hands might be preoccupied; hence the ease of operating access doors is very crucial in a hospital ward. This is even more so, with the need to ensure certain ward elements are access restricted, such as the clean utilities, where medicines are stored and prepared. Furthermore, for infection control purposes, a ward nurse may abstain from using both hands in operating an access door. All of these underscore the complex need to ensure access doors to certain spaces provide sufficient physical barrier against unauthorised persons, while being easily accessible to its users at the same time. Operating these access doors in these circumstances could be cumbersome and thus physically demanding for a ward nurse who may have to access certain spaces several times during their shift and may have to operate the access doors in an awkward posture. Hence, the WEAT POE checklist, in its assessment of the physical construct has placed an emphasis on this aspect of the architectural spaces of the assessed hospital wards. One of the key areas of focus in the extent to which a ward element supports the physical construct of ward nurses is evaluating how easy the access doors are to operate without compromising health and safety requirements. The following are examples of the design features from the WEAT POE checklist in which these ward elements have demonstrated exemplary performance:

- "access door handles located at a comfortable height between 0.90m and 1.00m from the floor surface"
- "access door permits operation by one person, in a single motion, with one hand and with little effort"

The photographic evidence of how these ward elements exhibit these design features, and therefore offer a comparatively higher level of physical construct support, can be seen in Figure 7.7. Conversely, in Figure 7.6, it can be seen that the low performers in the physical construct are the day room in Ward C, and the storage room and kitchen in Ward A. The following are examples of design features from the WEAT POE checklist in which these ward elements have fallen short of adequately supporting the physical constructs of its users:

- “at least 1.3m turning space for wheelchair”
- “access door fitted with a kick plate”

The day room in Ward C, for example, is so compact that it could neither be accessed by, nor could it accommodate, a wheelchair user as would be expected in a day room, as shown in Figure 7.8. However, it must be noted that in the absence of a proper day room, this ward element was a multi-functional space that served as a room for staff retreat during breaks, as well as for patients and their families. The lack of a designated function for this ward element made it inappropriate to serve any particular function. In the kitchen in Ward A, one of the key design features assessed, in which this ward element was lacking is the kick plate. This is a metallic plate placed at the lower end of an access door so as to allow the use of a leg to push through the door and to reduce physical effort to be applied by hand or when the user’s hands are not fully ‘available’ to access the space. This and other similar deficiency in important design features are some of the reasons why the kitchen in Ward C had comparatively fallen short of supporting its users in the physical construct (Figure 7.8). The graph in Figure 7.6 also shows that all the ward elements have attained a score of more than 50% in the physical construct. This might suggest that the importance of the contribution afforded by these design features to support the physical constructs in hospital wards has already been incorporated in mainstream design approaches. However, this compliance may also be the result of design focus to support patient therapeutic healing, which may be in correlation with those of nurses in most, but not in all, cases. Most of the ward elements assessed in the POE study are used predominantly by nurses; therefore design attention need to focus on how nurses use these spaces, rather than leaving compliance with regulatory requirements and standards to coincidental occurrences.

7.6.2.2 Cognitive Construct – Attained Constructs Score

A measure of the cognitive construct demonstrates the extent to which the ward elements support their users in undertaking task activities that require cognitive resources and therefore, may be mentally demanding. Figure 7.9 shows the attained cognitive construct scores for the 14 ward elements of the three wards. Two examples of the best performing ward elements are the nurse station in Ward B and the patient bay in Ward C. From the WEAT POE checklist, these two ward elements have demonstrated their adequacy in supporting their users cognitively through the following design features:

- “ward schedule planner/shift rota mounted on wall”
- “the farthest patient bay doorway visible from at least one nurse station”

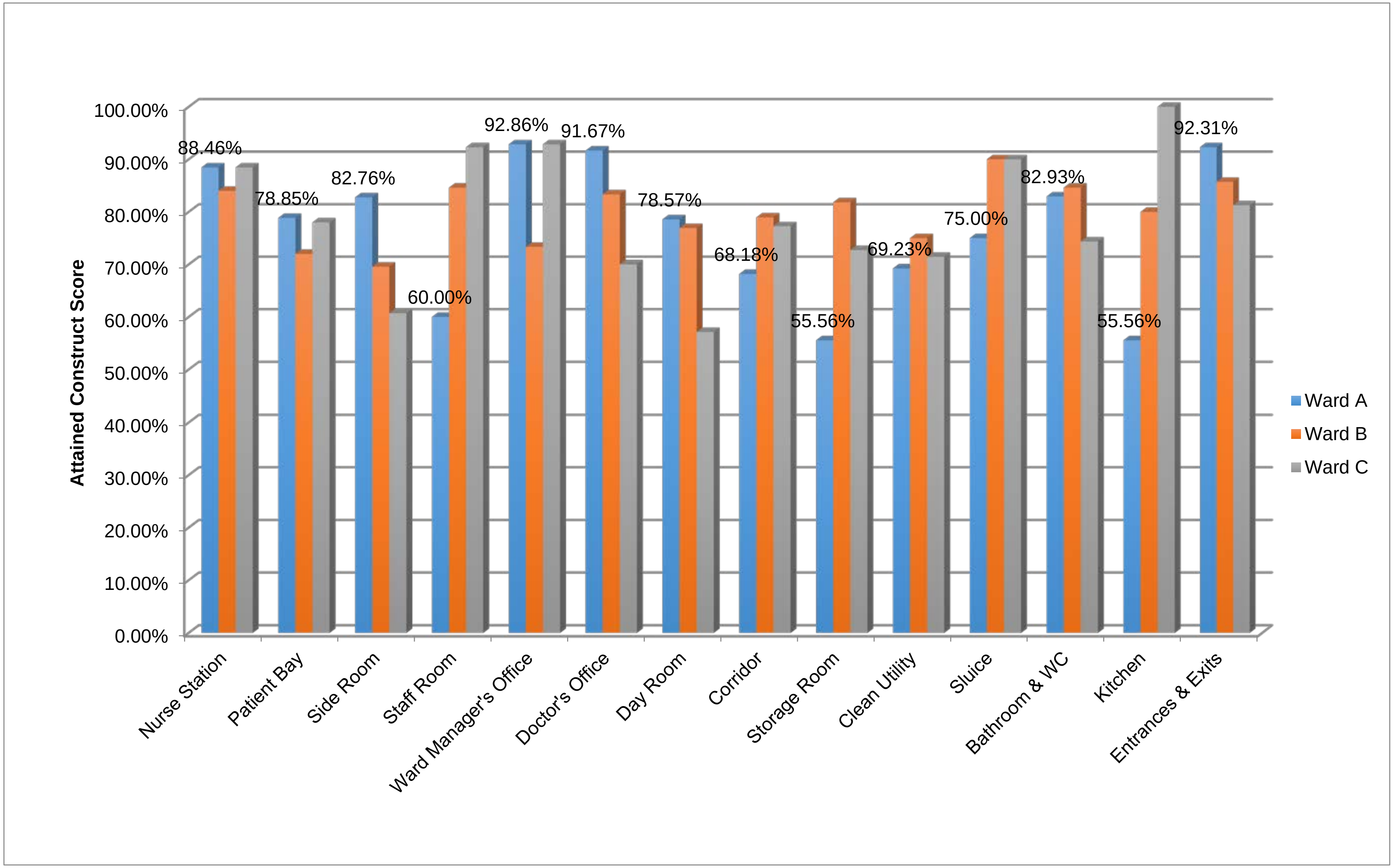


FIGURE 7.6: Physical Construct Scores of the Ward Elements

A view of doctor's office' door: Ward A

Kitchen door: Ward C

FIGURE 7.7: Examples of Ward Elements Scoring high in Physical Construct

A view of day room: Ward C

Kitchen door: Ward A

FIGURE 7.8: Examples of Ward Elements Scoring low in Physical Construct

The nurse station in Ward B exhibits the characteristics of a well organised work space, with several cues and an organisational board wall-mounted behind the desk, to serve as prompts for easy information transfer among the nursing staff (Figure 7.10). This may also reduce the need for the nursing staff to rely on their memory for key information, which may be a source of anxiety or cognitive fatigue. Likewise, the patient bay in Ward C has a nurse station located in situ, hence this reduces the need for nurses to combine cognisance of the patient welfare with other tasks, as the ability to visually see and hear the patient might potentially decrease the need to frequently visit the patient bays and, which may in turn attenuate patient anxiety.

From Figure 7.9, the two examples of ward elements that signifcantly fall short comparatively in their adequacy to support their users in the cognitive constructs are the doctor's office in Ward A and the day room in Ward C. The following are some of the design feaures in which these two ward elements have not fully demonstrated their adequacy to support nursing staff in the cognitive constructs:

- "acoustic insulation to reduce noise intrusion" and "absence of conflicting sounds" (Ward A)
- "view of activities within building but outside dayroom (e.g. view of circulation spaces through internal window"; Ward C)

The doctor's office is a central location where the medical staff undertake adminstrative tasks, team meetings and consultations. It is 'designed' for use by multiple individuals, hence, during the daytime (when data collection was conducted), the room was occupied by more than one person, while frequent walk-ins could be observed. Moereover, it seems that the door was always left open, so all activities, taking place on the corridor and surrounding areas, with sound emissions could be heard in the doctor's office. Indeed, since the door is not fitted with sound insulation, noisy activities would permeate even a closed door. Granted that doctors need to undertake activities including interacting with nurses; and also, since the room seem to be the 'safe haven' used by nurses to undertake tasks that require high level of concentration and solitude, the lack of acoustic insulation and the use of the room by multiple users effectively renders this ward element unfit as designed. Another example of a poor architectural design feature contributing to the low PCI score is the day room in Ward C. The space is supposed to serve the function of offering social spatial interaction for patients. The day room is also used by the nursing staff to consult with family members and used between family members and patients. It is perfectly conceivable that a nurse 'busy' with patients and their family members in a consultation session in the day room may need to be cognisant of what is going on in other parts of the ward, especially on the corridor. Maintainining this visual 'contact' is crucial in the nursing practice. However, in such a situation in the day room in Ward C, nurses are left to make the hard choice between closing the door, and losing that visual contact or leaving the door open, and thereby breach patients' privacy right.

There is another important issue to note about the day room in Ward C. It can be seen that the furnishing of this space replicates an office more than a home environment. The main reason for this type of furnishing is the multifunctional use of this ward element. While this ward element is deginated to be primarily a dayroom for patients, particpants have noted that is it is frequently used by members of staff for short breaks and retreats. Also as was suggested earleir, Ward C does not have a dedicated nurse station, compared to the other two wards. Nurses therefore use this ward element to undertake administarive tasks, which would otherwise, have been performed at a nurse station. This multifunctional use of space explains the furnishing. It also demonstrates management challenges in their attempt to satisfy both patients and the members of staff (Figure 7.8).

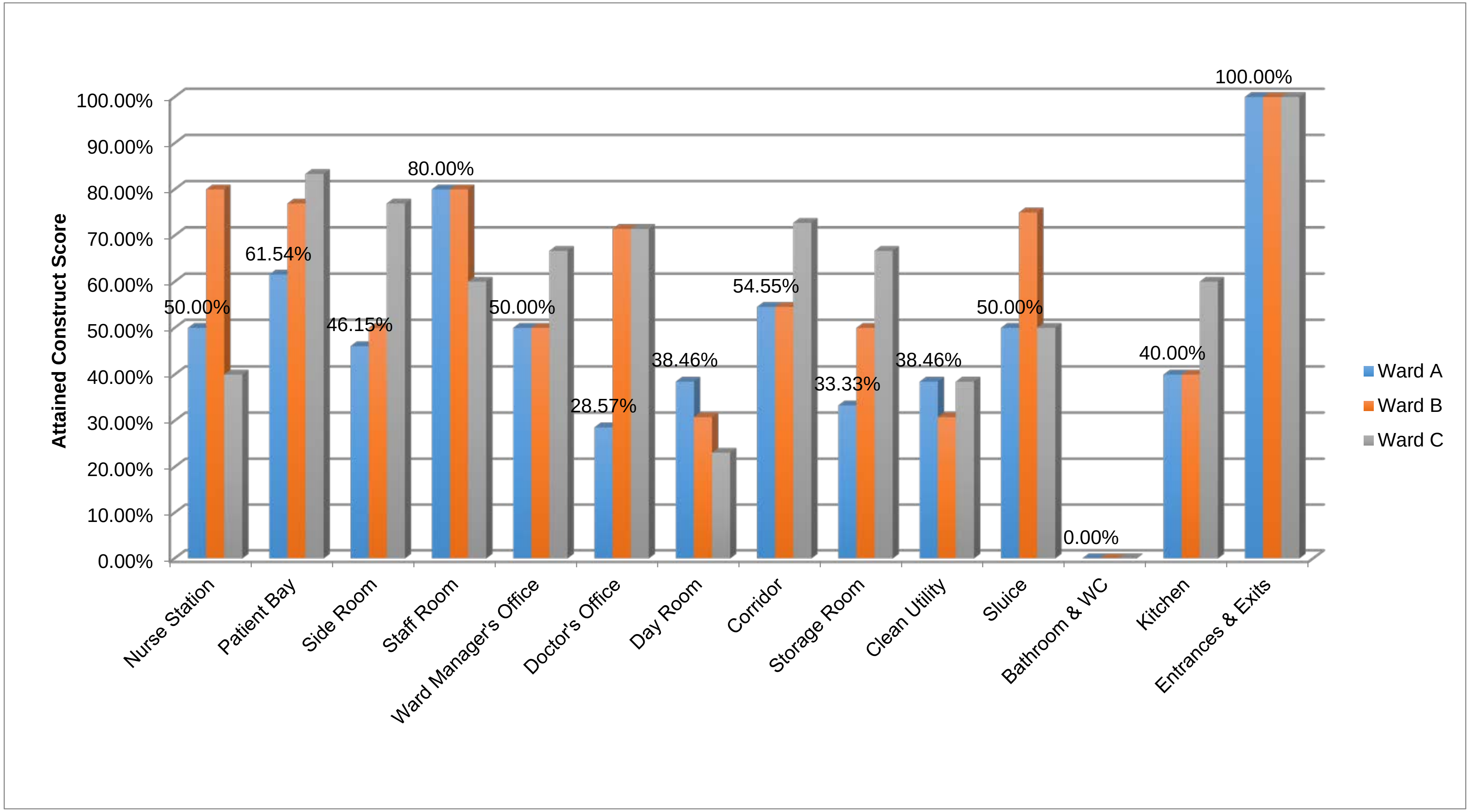


FIGURE 7.9: Cognitive Construct Scores of the Ward Elements

A view of nurse station: Ward B

FIGURE 7.10: An example of a Ward Element Scoring high in Cognitive Construct

7.6.2.3 Sensory Construct – Attained Constructs Score

The assessment of the sensory constructs in the WEAT POE exercise is used to demonstrate the extent to which the hospital wards support the use of the five senses, namely, sight, auditory, olfactory, tactile, and taste. This includes the assessment of the sound level, the lighting, or the presence/absence of unpleasant smell. In part, this is also a measure of the ambient environment. While the existence of most of these environmental characteristics were determined through direct observation, such as smell or adequate ventilation, others required the use of an Environment Meter like the one shown in Figure 7.4 to capture and record the characteristics of the ambient environment. Figure 7.11 shows the scores of the sensory constructs for all the 14 ward elements in the three wards. The best performing ward elements are the staff room and the side room both in Ward A. The following are examples of the design features in which these ward elements demonstrated a high level of adequacy for the support of ward nurses in the sensory construct:

- “natural daylight adequate without use of artificial lighting (ample, no glare)”
- “sound level satisfactory”

Establishing an adequate level of lighting for different workspaces requires an objective metric measurement. While the presence (or absence) of glare, may be determined through direct visual observation, light sufficiency in a ward element may be skewed by subjective perception of the observer. Illuminance is the objective measurement of the amount of light falling on a surface and is measured in lux. Lux = lumen/m^2; where lumen is the total perceived power of light coming from a particular source (Autodesk Education Community, 2015). The measurement of "adequate" light in this study is given in lux and is based on the guidelines suggested by Autodesk Education Community. Please see Appendix 7.1 for a table of lighting measurement guidelines relevant to spaces and their functions. Compared to the 500 lux recommended as a minimum for an interior space with similar characteristics, 621 lux was measured in the staff room in Ward A. Light levels are measured as ward elements are used in practice, with or without artificial lighting. If artificial light was put on in a ward element, then it was deemed to be due to the insufficiency of the natural daylight.

While it may be possible to establish if an environment is noisy or not, it is paramount for this measure to be objective, especially as a means of determining the acceptable noise level for patient recovery. Restless patients may eventually require the attention of nurses, which may cause avoidable fatigue for ward nurses. The metric unit for sound level is decibel (dBA). The sound levels in this case study hospital wards were measured using the Environment Meter shown in Figure 7.4. Essentially, the assessment of 'sound level' was intended to determine whether the noise level remained below regulatory or guideline thresholds in the ward element. Noise is defined as "unwanted sound" (World Health Organization, 1999, p. vii). This WHO noise guideline suggests that environmental noise at or below 70 decibels (dBA) will generally "…not cause hearing impairment in a large majority of people even after a lifetime exposure…" (p. viii). The UK's The Control of Noise at Work Regulations 2005 stipulates that employers must take measures to reduce noise, or the adverse effect therefrom, in instances when the daily or weekly personal noise exposure has reached an upper limit of 85 dBA (Health and Safety Executive, 2005). However, the WHO recommends that in a hospital environment, an upper limit of 40 dBA should be observed and rooms occupied by patients are not to emit noise exceeding the 30 dBA threshold. A sound level of 37.3 dBA was recorded in the side room in Ward A during daytime measurement and also with the room unoccupied. Due to their single occupancy, side rooms are expected to exhibit lower sound levels compared to multi-occupancy patient bays.

The day room in Ward C and the kitchen in Ward A both demonstrated lower performance in their adequacy to support the sensory construct of its users. It is noteworthy that these two ward elements (Figure 7.6) are also low performers in their support for the physical construct of ward nurses. The following are examples of the design features in which these two ward elements proved to comparatively be less supportive of the sensory constructs of its users.

- "doorway or room traffic visible from at least one nursing station"
- "sound level satisfactory"

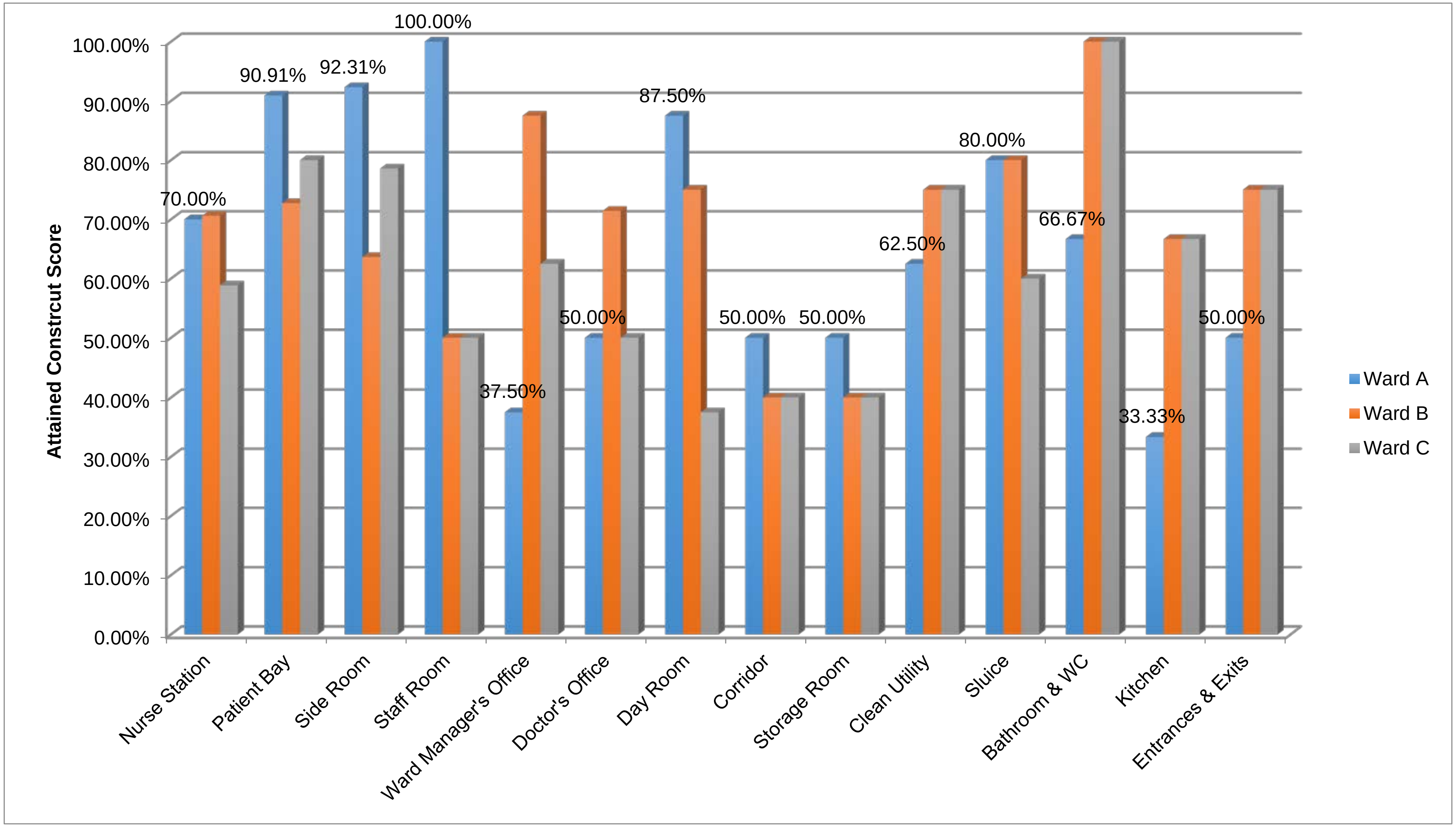


FIGURE 7.11: Sensory Construct Scores of the Ward Elements

The importance of ward nurses being able to maintain visual connection with their patients was discussed in Chapter 6. Since the day room is a ward element used by patients and their relatives, nurses need to be aware of the movement in and out of this architectural space in order to ensure that their patients remain safe. The 'day room' in Ward C is a multi-functional ward element, which is used by members of staff for short breaks and retreats; as well as by patients and their relatives. The layout of this space is de facto inadequate as a day room; hence this might explain the lack of visual connection between this ward element and the nurse station. The kitchen in Ward A also showed a comparatively poor performance in the measured ambient sound level. Again, it is to be noted that this space had no natural daylight and no means of natural ventilation. As the photograph in Figure 7.8 depicts, users of the kitchen may therefore need to keep the access door ajar in order to ensure unpleasant odours are not trapped in this ward element (Figure 7.8). This has a cumulative effect of allowing noises from the circulating areas to enter the kitchen. This is a good example of how interdependent one design feature is on the other to precipitate various outcomes for the users of architectural spaces. This understanding, if coupled with the careful design of a ward element, on the other hand, may produce cumulative positive results for ward nurses and other users.

7.6.2.4 Universal Construct – Attained Constructs Score

The fourth construct of investigation in the WEAT POE survey is the universal construct. The assessment of the universal construct is a demonstration that the hospital wards support nurses in their basic needs and expectations, in areas such as privacy and dignity; pace of work; design to reduce risk of clinical errors; design for team collaboration and the design for health and safety. The ward manager's office in Ward B and the clean utility in Ward A are two examples of ward elements high in their performance to support ward nurses in the universal construct. The design features used to explore the adequacy of these ward elements in support of the universal construct include such items as:

- "accommodates at least four other people seated for short meetings"
- "segregated waste disposal skips installed"

Space, layout and the spatial sufficiency are very crucial in a ward environment, especially for team collaboration and interaction. The absence of adequate space may mean that ward nurses would have to carry out certain task activities in spaces, which are not fit for purpose. As discussed in Chapter 6, a task such as handover, for example, should be undertaken at the patient bedside, at the nurse station or in the ward manager's office. However, lack of adequate space may result in handover being conducted on the corridor, a practice, which might equate to patient confidential information being discussed in a quasi-public space. It is therefore essential that the ward manager is able to convene team meetings with both the nursing staff and other multidisciplinary teams without compromising patient data protection rights. As shown in Figure 7.13 the ward manager's office in Ward B is a high performer in this respect. Aside from the ward manager's desk, there is a spare desk with a chair and two other free chairs and sufficient space that can be used to facilitate group meetings.

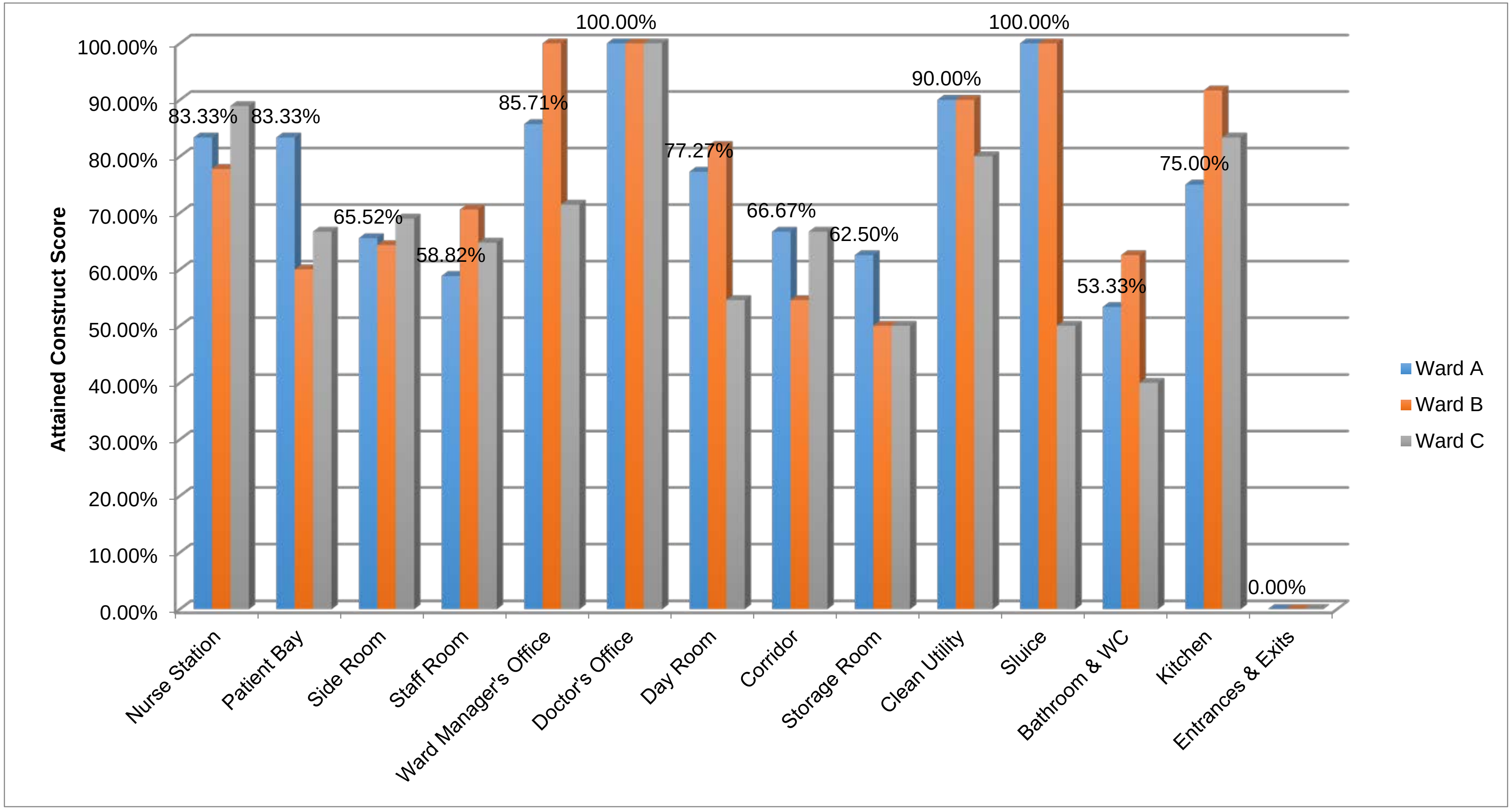


FIGURE 7.12: Universal Construct Scores of the Ward Elements

Another example of a ward element that has demonstrated high performance in its support for the universal construct is the clean utility in Ward A. One of the conclusions drawn from the results of the exploratory focus group presented in Chapter 4 is that ward nurses are apprehensive of committing clinical errors, including the risk of medication errors, infection or the exposure to sharp injuries. Research has found that a well-laid out and legible workspace has the ability to reduce medication errors (Mahmood et al., 2011). As discussed in Chapter 5, medication is one of the multilateral tasks nurses perform, which may include subtasks, such as drip rates or drug dosage calculations. These subtasks require a high level of concentration, and the environment in which they are carried out has a huge impact on their outcomes being either favourable or adverse.

A view of ward manager's
office: Ward B

A view of clinical waste, pharmacy returns and sharps waste bins: Ward A

FIGURE 7.13: Examples of a Ward Element Scoring high in Universal Construct

To establish the dynamics between medication task and the clean utility, where some of the tasks are undertaken, the design features in the WEAT POE checklist assessed the provision of segregated waste disposal, as this is a crucial part of the medication procedure. Separate skips are provided for clinical waste, pharmaceutical returns, and sharps (such as used needles). These provisions relieve nurses of the need to take special attention to ensure these wastes are properly disposed of. Attention to such details demonstrates high work ethics, which creates a safe and more relaxed work environment.

According to Figure 7.12, an example of a ward element lagging behind the others in the area of universal construct support is the bathroom in Ward C. Design features assessed for the adequacy of this ward element to support universal constructs are:

- “choice of bath or shower”
- “access door lockable from inside”

These bathrooms and WCs are used for the personal care needs of patients. The provision of choice of bathroom or shower for patient use is for the convenience and personal preference of the patients. This is even more so as Ward C is a medical ward with some of the patients having to stay for a longer period of time. This is a potential source of dissatisfaction for patients and may provoke unpleasant or antisocial behaviours, which nurses may have to address. Also, the POE exercise on this ward revealed that the access door to the bathroom was not lockable from inside, which undermines patient privacy and dignity. It can be seen in Figure 7.14 that the shower shield is only waist high and unless the shower curtain is drawn, a passerby on the corridor may inadvertently have direct visual access to the activities going on in the bathroom.

A view of the bathroom & WC: Ward C

FIGURE 7.14: Examples of a Ward Element Scoring low in Universal Construct

7.6.3 Important Remarks on the WEAT POE Results

One of the most important lessons that can be drawn from this POE survey is related to the assessment of nurse stations, with particular attention to Ward C, which had actually not been equipped with a nurse station. The architectural space that was originally designed to be a nurse station (and assessed for this POE) was being used by the ward clerk at the time of the POE survey. The ward clerk is an administrative personnel that carries out certain tasks on behalf of the ward nurses. During the validation stage of the WEAT checklist, the FM manager underlined that the NHS Trust is piloting phasing out fixed desk-based nurse stations and replacing them with the mobile computerised nurse station. With this new initiative, the FM suggested that the Trust is currently exploring the possibility of taking the care to the patient instead of moving patients from the patient bays to various procedures. The FM manager noted that the use of mobile nurse stations will be more prevalent, and the old traditional fixed design nurse stations may soon disappear from the hospital wards. This is an important development for future hospital ward designers.

While some participants did highlight mobile stations as an effective tool in their work environment, it is useful to understand the impact that the future use of space might have on space design in this context, as a result of a more novel and strategic decision to take care to patients. It is also noteworthy, that despite reaching and exceeding the PCI score threshold, the space being used by the ward clerk in Ward C, and assessed in the WEAT POE, scored the lowest of the three ward elements.

Table 7.2 presents an extract of the POE checklist completed for the nurse station in Ward C. A similar checklist had been completed for each of the 14 ward elements. Please find an electronic version of the full WEAT POE checklist attached to this thesis.

7.7 Limitations of WEAT

The main objective of this PhD study is the development of the NTEA Framework that can be used to create a fit between nurses' capabilities and their work environment in a hospital ward setting. However, creating a fit between ward nurses and their environment requires a better understanding of what characterises a good work environment. This understanding must be achieved through an objective evaluation of the physical environment. A thorough review of the literature revealed that a ready-to-use ward environment assessment instrument was not in existence at the time of the review. It was therefore decided that a new tool must be developed in order to achieve the overarching aim of the research project.

TABLE 7.2: Extract from the WEAT POE Checklist of Ward C showing the Nurse Station

Ward Environment Assessment Tool							
WARD ELEMENT CODE	**WARD ELEMENT**	**PERSONAL CONSTRUCTS**	**NUMBER OF DESIGN FEATURE**	**PCI SCORE**	**RATING: Present (1) Absent (0) Not Applicable (n/a)**	**DESIGN FEATURE DESCRIPTION**	**Remarks**
	nurse station	physical	1		1	staff kitchen not farther than 25 metres from the farthest nurse station	
	nurse station	physical	2		1	staff WC separate from patients' and visitors' facilities	
	nurse station	physical	3		0	staff WC offers gender choices	
	nurse station	universal	4		1	at least two nursing computer workstations with ergonomic seating	
	nurse station	universal	5		1	accommodates at least two further nursing staff sitting to facilitate team collaboration and short meetings	
	nurse station	physical	6		0	desktop height adjustable	
	nurse station	physical	7		1	if desktop height not adjustable, then desktop not more than 75cm from floor finishing	72 cm measured on site.
	nurse station	universal	8		0	desktop surfaces covered with infection resistant finishing	
	nurse station	universal	9		1	desktop with bar to conceal paperwork from visitors/outsiders	
	nurse station	physical	10		1	computer keyboard separate from screen	
	nurse station	physical	11		1	computer keyboard tilt to allow flexible keying positions for different users	
	nurse station	sensory	12		1	computer keyboard characters clear and readable	
	nurse station	sensory	13		1	computer keyboard free of glare and reflection	
	nurse station	physical	14		1	computer mouse positioned close to user without need to stretch	
	nurse station	universal	15		1	computer mouse allows flexibility in positions for multiple users (considers both left and right	

						hand users)	
	nurse station	physical	16		1	user's wrist and forearm can be supported on desktop	
	nurse station	sensory	17		1	display screen clear and readable	
	nurse station	sensory	18		1	display screen free of glare and reflection	
	nurse station	physical	19		1	display screen swivel and tilt	
	nurse station	sensory	20		0	if display screen placed facing a window, adjustable blinds installed	No blinds or screen protector, but user said glare not disturbing.
	nurse station	sensory	21		0	if window blinds not suitable to remove glare and reflection, anti-glare screen filters provided	
	nurse station	universal	22		1	desktop surface large enough for all equipment, papers, etc., considering multiple users	
	nurse station	universal	23		1	desktop surface tidy, not overcrowded	
	nurse station	physical	24		1	all equipment on desktop reachable by user, considering multiple user	
	nurse station	universal	25		1	desktop offers rearrangement options for multiple users	
	nurse station	sensory	26		1	desktop surfaces free from glare and reflection	
	nurse station	universal	27		1	chairs suitable	
	nurse station	physical	28		1	chairs stable	
	nurse station	physical	29		1	chair seat has back height and tilt adjustments	
	nurse station	physical	30		1	seat height adjustable	
	nurse station	physical	31		1	chair glides for flexible positions	
	nurse station	physical	32		1	small of the back supported by chair's backrest	
	nurse station	physical	33		1	desk leg area allows free movement of legs	
	nurse station	physical	34		1	desk leg area free of obstruction	
	nurse station	physical	35		1	feet flat on the floor without undue pressure on user's backs of the leg	

	nurse station	physical	36		1	forearms horizontal, at ease and comfortable	
	nurse station	physical	37		1	screen display positioned so that user's eyes at roughly the same height as the top of the display screen	
	nurse station	physical	38		1	user seated with straight back, supported by the chair	
	nurse station	physical	39		1	user seated with relaxed shoulders	
	nurse station	universal	40		1	chair adjusted correctly for current user	
	nurse station	physical	41		1	workstation offers enough room to change position and vary movement	
	nurse station	universal	42		1	workstation cables tidy, free of trip or snag hazards	
	nurse station	universal	43		1	cupboards installed for basic nursing items (not medicines)	
	nurse station	sensory	44		1	floor surface, slip-free and glare-free	
	nurse station	universal	45		1	flooring adequately maintained	
	nurse station	universal	46		0	floor and wall intersection coved to prevent dirt building up on floor corners	
	nurse station	cognitive	47		0	tabard pinafore provided for medication rounds	
	nurse station	cognitive	48		1	equipped with adequate stationeries and writing materials for note taking	
	nurse station	cognitive	49		1	stores charts and notes for patient care-related documentation	
	nurse station	cognitive	50		0	if only one nurse station, desktop and sitting accommodates at least one third of staff at a time for writing patient charts and documentation	
	nurse station	cognitive	51		0	ward schedule planner/shift rota mounted on wall	
	nurse station	sensory	52		0	acoustic insulation to reduce noise intrusion	63.4dBA recorded on site
	nurse station	sensory	53		0	all patient bays & side rooms visible from at least one nurse station	
	nurse station	sensory	54		0	corridor wall glazed to enhance visibility to patient bays	
	nurse	sensory	55		0	if no glaze demarcation, appropriate sound	

	station					insulation facilitates confidential telephone conversation	
	nurse station	sensory	56		1	natural daylight adequate without use of artificial lighting (ample, no glare)	928 lux recorded
	nurse station	sensory	57		0	ambient lighting fitted on desktop	
	nurse station	universal	58		1	temperature satisfactory	22.7 degree recorded on site
	nurse station	sensory	59		1	sound level satisfactory	
	nurse station	universal	60		1	natural air ventilation through window	
	nurse station	universal	61		1	air quality satisfactory (not stuffy or draughty)	
	nurse station	universal	62		1	observed air movement	
	nurse station	sensory	63		1	absent of unpleasant smell	
	nurse station	sensory	64		1	absent of conflicting sounds	
	nurse station	physical	65		0	access door/barrier fitted, not open access	Open access. No doors or barriers
	nurse station	physical	66		1	threshold avoided	
		two-third rule:	**75.86%**	**77.27%**	**51**		

Against this backdrop, it should be understandable that WEAT was conceived out of the need, and as a means, to assess the ward environment. One of the critical limitations to the use of WEAT, is its transferability for use in other settings. An environment assessment tool designed specifically for the evaluation of the ward environment would have benefitted from the possibility of a full-scale validation by testing and retesting the instrument on a large number of wards in order to identify and remove areas that are less fit for purpose. WEAT, on the other hand, had only been used and tested on three hospital wards, which opens it to criticism of not being quantitatively and independently validated. The validation of WEAT was undertaken with the FM manager of the NHS Trust, at which data collection was conducted. Therefore he might be seen as an insider whose opinion might not be entirely objective. This, however, does not detract from the quality of the validation as the results of the POE survey will be put to further test and validated after the NTEA Framework had been developed, as will be demonstrated in Chapter 8.

Another important observation that was made in the administration of WEAT was that there were some ‘outliers’ in the datasets. For example, the entrances and exits, with a score of 100% for the three wards in the cognitive constructs. Then the bathroom & WCs with a score of 0% for the three wards in the cognitive constructs. With regard to the entrances & exits, there were only three design features used to assess the adequacy of these ward elements, hence the compliance with these three design features made it ‘relatively easy’ to attain a 100% high score in the cognitive construct. On the other extreme end of the spectrum is the case of the bathrooms and WCs which did not have any design features assigned to them suitable for the assessment of the fitness of this ward element to support the cognitive constructs of its users. These two ‘outliers’ reveal some of the shortcomings of WEAT, the resolution of which may be a subject for further research. Barring this shortcoming WEAT was instrumental in the assessment of the all the ward elements through the design features relevant to personal constructs of its users.

Furthermore, while every effort had been made in its compilation to ensure that the WEAT checklist is as comprehensive as possible, it would benefit from further reviews to update the tool with more design features to increase the rigour of the instrument. It does, however, comprises of all the important features and items raised by the users during the exploratory focus group discussed in Chapter 4 and the investigative interviews presented in Chapters 5 and 6.

WEAT is an excel-based format checklist, with meticulous attention devoted to making its administration user-friendly. However, the tool could benefit from more robust programming. For example, items that were deemed irrelevant during the data collection process were manually removed from the list before calculating the PCI score for each of the ward elements. The programming of the tool would create an automated means of ensuring these items of the design features are accounted for in the calculation of the PCI score. A great advantage of the manual calculation of these PCI scores was that it enabled the researcher to get acquainted with the features of the tool. This was an important prelude to automated programming.

In spite of the aforementioned shortcomings, WEAT is a useful environment assessment tool in its own right for a number of reasons. In the first instance, WEAT is the first comprehensive ward environment assessment instrument designed specifically for the evaluation of hospital wards from the perspective of a large group of users, which have hitherto, been ‘marginalised’. Contemporary healthcare facilities have concentrated on the need for the design of the physical environment to support patient therapeutic healing, while underrating the position of ward nurses in so doing. Situated in the core of the patient healing process, ward nurses play a crucial role in the management of the ward environment in the interest of their patients. In this role, the needs of the ward nurses must be accounted for. By first exploring the demands of the nursing profession and then incorporating ward nurses’ needs in the checklist, WEAT was able to combine design standards and guidelines with the actual needs of ward nurses. By beginning with the end users in mind, WEAT is representative of a bona fide instrument for the assessment of hospital wards.

Moreover, as a pioneer initiative, WEAT can be a useful starting point for other researchers exploring the interplay between the physical environment of hospital wards and the nursing staff. This is a point where, from the perspective of this PhD study, an original contribution to knowledge has been created.

Finally, and this will be demonstrated in the next chapter, WEAT as a precursor, has successfully contributed to the development of the framework to support the creation of a fit between ward nurses and their work environment.

7.8 Summary of Chapter 7

This chapter presented evidence to demonstrate how the objective assessment of the physical characteristics of the NHS hospital wards support ward nurses. This goal was fulfilled by using WEAT to perform post-occupancy evaluation of three NHS wards of the case study hospital. The concept behind the data collection and analysis were presented. Chapter 7 proceeded by discussing the results of the POE. The PCI score of each ward element was presented and compared across the three hospital wards. The four constructs impacted by the ward elements were explored in greater detail, to determine the well-performing and those that require further attention. As WEAT was being used for the first time, it was important to highlight any major concerns experienced during its implementation, therefore the major limitations to implementing WEAT were noted.

CHAPTER 8: NURSING TASKS AND ENVIRONMENTAL ASSESSMENT FRAMEWORK

8.1 Introduction

This chapter presents the final output of this research study, which is the Nursing Tasks and Environmental Assessment (NTEA) Framework. First, the rationale for developing the NTEA Framework is articulated, then the conceptual framework that guided the research process is presented, by exploring how each of its three components contributed to the research process. Furthermore, the mapping of the two dimensions of the NTEA Framework and the validation process are discussed. The five primary stakeholders of the NTEA Framework and how they may implement the NTEA Framework are highlighted. The chapter discusses the four stages of the building lifecycle, when the NTEA Framework could support its implementers to make informed decisions regarding the nursing personnel and the respective healthcare facilities; and concludes by outlining how the model could be implemented.

This research set out to develop a 'framework', a new tool to support the creation of a fit between ward nurses and their work environment. However, while this Framework has been constructed based on the results of the empirical field investigations, it is a derivative of the conceptual framework introduced in Chapter 2. At this point, it is paramount to reiterate the fundamental difference between the conceptual framework that has guided the research process and the NTEA Framework developed in this research project.

8.2 Rationale for Nursing Tasks and Environmental Assessment Framework

For the P-E fit theory to achieve its novel goal, it has to be put to practical use in the case of older people in the home environment setting. The Housing Enabler was developed based on the theoretical premise of the P-E fit, as a practical instrument to assess the physical characteristics of the home environment and how they support people with functional or mobility limitation and undergoing rehabilitation. This practical implementation was achieved, through the development of the Housing Enabler instrument. Following this line of thought, it is conceptualised that the applicability of the P-E fit could be explored in the workplace as well with respect to older nurses. The Nursing Tasks and Environmental Assessment (NTEA) Framework was therefore conceived out this conviction, to be a practical instrument for implementation in the creation of a fit between older nurses and their work environment.

8.3 Applying the Conceptual Framework

As discussed extensively in Chapter 3, under research methodology, a qualitative researcher must be cognisant of his or her worldview in the sense that this will be value-laden, and therefore may not be completely free of bias. However, the researcher's values need not necessarily be entirely subjective and unfounded. It may derive its objectivity from well-established theoretical concepts. For example, the conceptual framework of this research project derives its theoretical foundations from the person–environment fit theory, which was discussed in detail in Chapter 2. There, it was established that the built environment may be an enabler or disabler, depending on how the ease of use had been designed and built into the environment, by applying some of the principles of universal design also discussed in Chapter 2 under Design Principles. Along the continuum of 'objective' and 'subjective' lies the researcher's 'perspective' (Figure 8.1) to the research. Therefore whereas the conceptual framework is the researcher's perspective toward the field of investigation, it had been constructed out of well-founded theory. With a rigorous research design, in which appropriate checkpoints are embedded, the researcher's bias may be reduced to an 'acceptable' level. The research design of this project had been complemented by adherence to applicable research ethics and protocols.

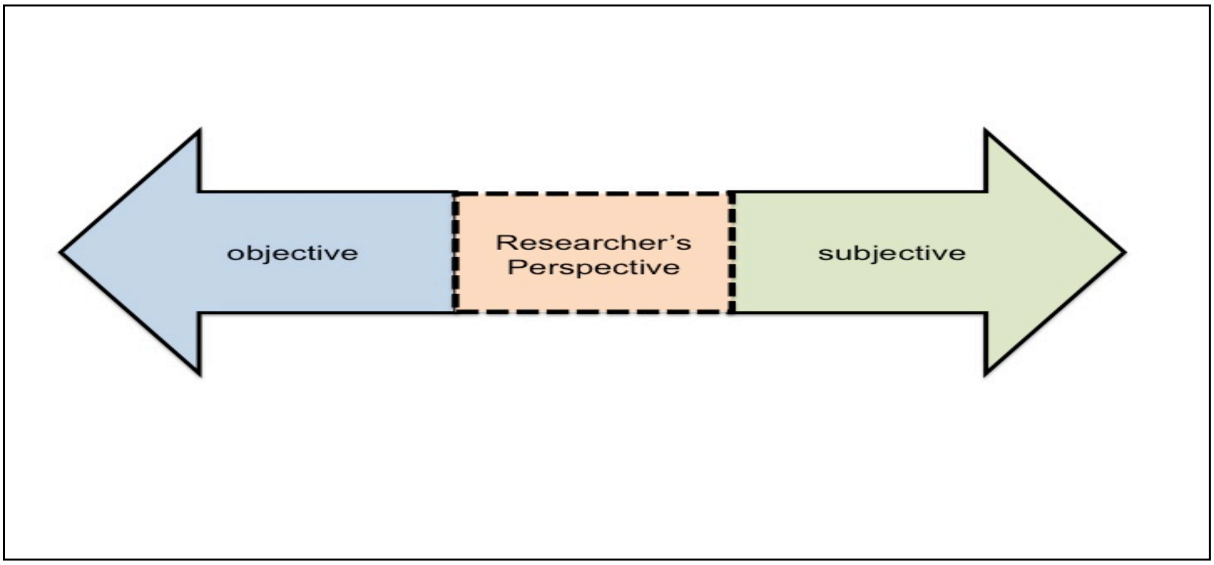


FIGURE 8.1 The Objective – Subjective Continuum

The conceptual framework is the lens through which the researcher approaches the field of investigation. It is the researcher's frame of reference, i.e. his or her epistemological approach to knowledge construction. While the term conceptual framework appeared to have been used in various contexts in research literature, very few authors have attempted to establish a working definition for it in its own right. Imenda (2014) opines that a conceptual framework is a synthesis of existing views of the research problem, constructed from both literary and empirical findings. The conceptual framework is a model that frames the way the researcher sets out to conduct the research. This includes, among others, the stating of the research question, designing the research methods, selecting relevant literature resources, and approach to data collection, analysis and interpretation. A conceptual framework is even more important in a multidisciplinary research such as this PhD project, which had explored the research question from the perspectives of various, seemingly unrelated disciplines, including architecture, gerontology, psychology and sociology. In this case, adopting a single concept, without complementing it with other concepts might have tilted the research in one particular direction, however inadvertent or preconceived that course might be. By developing a conceptual framework, the whole research process was focused and guided.

The conceptual framework for this study was not simply theory-based, without any empirical background. Before the conceptual framework was constructed and fine-tuned, workplace exploratory studies (discussed in Chapter 4) were undertaken to identify potential directions or courses that the research project might follow. The results of the exploratory interviews, presented in Chapter 4, showed that older workers, including older NHS nurses are most apprehensive of three aspects of their job; namely health, retirement, and flexibility at work. These three themes formed the thematic dimension of the research study. These themes were then put in the context of the P-E fit to establish the five personal constructs that would be affected by the physical work environment within the NHS. A research matrix was plotted (Table 4.6) to identify how the thematic dimension correlated with the personal construct dimension. At this stage, the research arrived at a crossroad, when it was decided how to proceed further with the investigation. It was obvious at that point that this research project must be selective and focussed with regard to what was achievable within the timeframe and available resources. It became apparent that not all the three issues raised by the nurses could be fully explored within the remit of this study. Also, attempting to investigate all the five personal constructs might disorientate the study, making it difficult to achieve rigour.

While this study aspired to investigate a research problem multidisciplinary in nature, it is situated within the built environment discipline, which affected the types of decisions made at crucial stages of the project. Furthermore, the personal preferences of the researcher, the expertise of the supervisory team, and the accessibility of field data, helped to fine-tune the research question and orientate the research course. Therefore, after these workplace exploratory studies three crucial decisions were made. First, there was literary evidence that, for older workers, health is a major predictor of the intent to stay on the job or exit prematurely. In addition, it was suggested that since the field of investigation was the healthcare sector, 'health', as a theme would be pursued further from the three items in the thematic dimension of the research matrix. Secondly, of the five items in the personal constructs dimension, only the physical, cognitive and sensory constructs were further investigated (Table 4.6). It was presumed that building on the P-E fit theory, the interplay between the built environment and these three personal constructs of nurses could be better illuminated in this study. A fourth personal construct, termed 'universal construct', was created to account for other important personal resources required by nurses to carry out their duties, and which are more likely to be affected by the design of the built environment. Thirdly, the workplace exploratory studies also helped to establish evidence for the hypothetical presumption of the research question, as it was at this stage that it was decided, that instead of a broader scope of older workers within the NHS, the study should focus on older nurses. This is because nursing is the most widely practised profession within the NHS; therefore, exploring the nursing profession is expected to make the greatest knowledge contribution in the UK.

Defining these parameters helped to outline the research boundary, and how further investigations might proceed, including the literature review and empirical fieldwork. Further research queries were designed around these themes. These, put in the context of the P-E fit, shows how the built environment may support nurses' health and wellbeing at work, augmenting their physical, cognitive, sensory and universal constructs.

The conceptual framework for this research study consists of three components, namely job demands, functional capacity and environmental demands of the nursing personnel. Job demands are those characteristics of the nursing job role that have the greatest impact on practising nurses. The functional capacity of nurses is the ability of nurses to functionally perform their duties in their job role. Environmental demands are those attributes of the environment, which may be resources or stressors for nurses working in such a setting. Underpinned by the P-E fit theory, this conceptual framework (Figure 8.2) determined the research approach adopted throughout this research project.

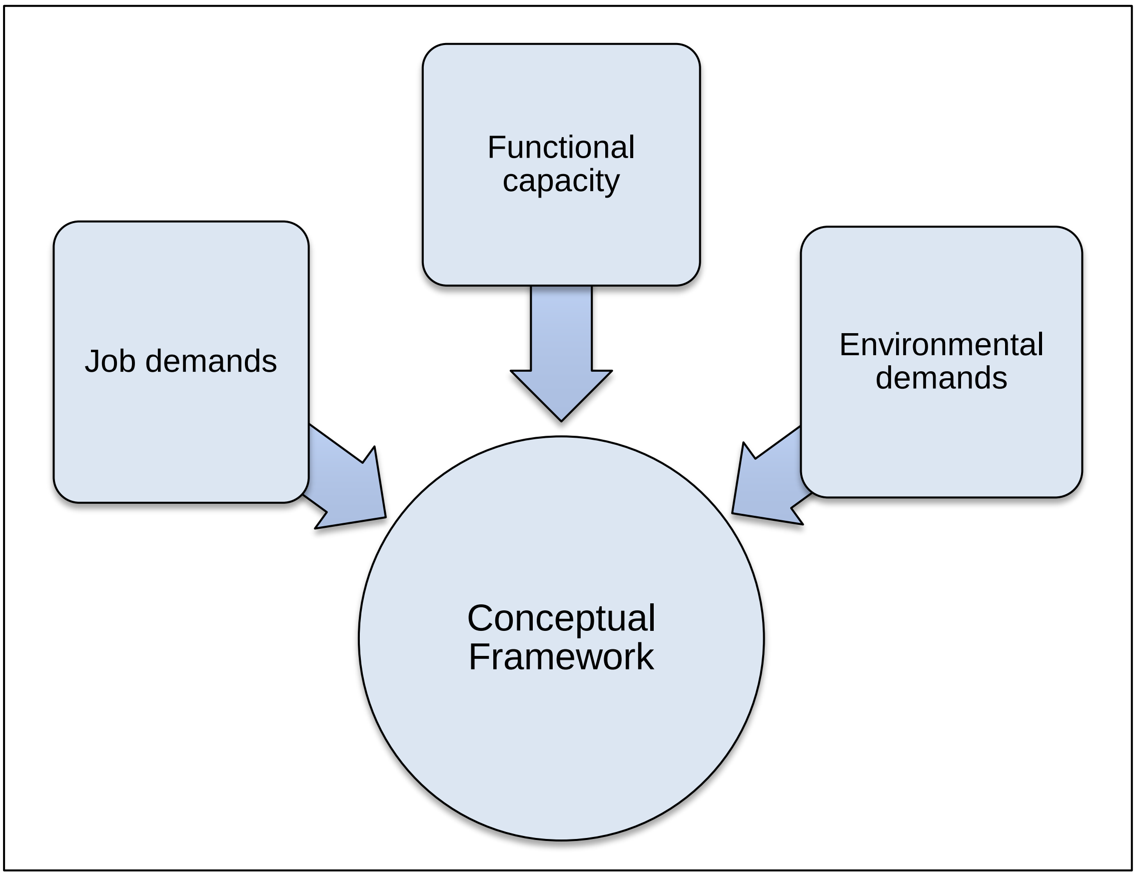


FIGURE 8.2 The Conceptual Framework

8.4 Exploring the Conceptual Framework

While this research study was designed to be a linear process, it must be noted that it had also been an iterative exercise. The following sections reiterate the findings of the earlier stages of this research, by exploring the three components of the conceptual framework and how these informed the creation of the NTEA Framework.

8.4.1 Exploring the Job Demands

The exploratory focus group presented in Chapter 4 established that due to their job demands, ward nurses would most probably move on to more sedentary roles to remain in nursing practice; however, most nurses would exit the profession altogether if they had no choice but to work on hospital wards. It was established in Chapter 4 that the five reasons why ward nurses would most probably exit the profession or move on to other sedentary roles are: moving and handling tasks; inaccessibility of training; fast pace of work; risk of committing clinical error; and lack of team cohesion (Figure 8.3). The exploratory focus group also provided a corroborative evidence for the relationship between the job demands and the personal constructs of older nurses within the NHS. The findings of the exploratory focus group did suggest that it was necessary to understand the intricacies of the tasks that ward nurses perform. The design of the next stage of the research project was based on these findings.

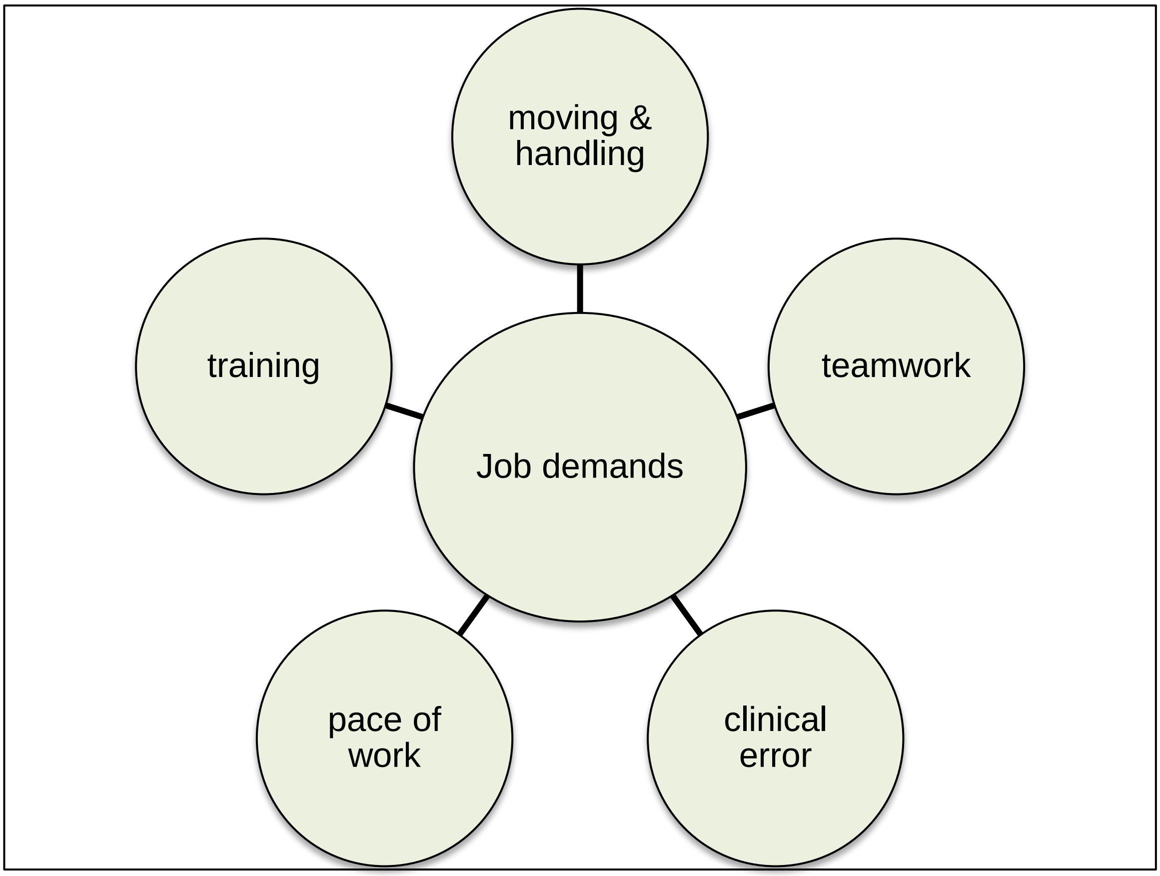


FIGURE 8.3 Nursing Job Demands

8.4.2 Exploring the Functional Capacity

The second component of the conceptual framework is the functional capacity of ward nurses. Moving from the broad perspective of the job demands of hospital nurses in general, Chapter 5 then delved into the ward nursing practice by conceptualising the demands of ward nursing tasks as a result of the direct or indirect interaction between the nurse and the patient. Three domains of patient-nurse interaction were identified; namely patient care, patient surveillance and patient support. In this interplay, two groups of nursing tasks were identified. Multilateral tasks that could be further divided into subtasks and unilateral tasks, which are single task activities. By plotting each subtask of the multilateral task and each unilateral task against the relevant patient-nurse interaction domain, the Nursing Tasks Demand Matrix was created. The Nursing Tasks Demand Matrix is an alternative approach to nursing functional capacity evaluation, which is based on the premise that the demands of the nursing tasks are given; however, a conducive work environment could enable ward nurses to perform as expected in the ward areas. It must be reiterated at this stage that while the Nursing Tasks Demand Matrix helped to illuminate the nuances of the tasks nurses perform on hospital wards, it is a means to an end, and not an end itself. The 'end' is the ultimate objective of this research project, which is to create a fit between ward nurses and their work environment. Hence, the Nursing Tasks Demand Matrix was one of the antecedents of the NTEA Framework.

8.4.3 Exploring the Environmental Demands

The third component of the conceptual framework is the environmental demands of the nursing profession. It was conceptualised that, while nurses rely to a great extent on the four personal constructs; these must be supported by an enabling environment. Therefore, it was necessary to independently assess the adequacy of the ward environment in this respect. Through the investigative interviews undertaken with ward nurses, the relevant ward elements where the nursing activities take place were identified. Further, in Chapter 6, the need to develop a ward environment assessment tool was established, as an in-depth review of the literature did not identify a suitable tool that would have been readily fit for purpose. The Ward Environment Assessment Tool (WEAT) was conceived out of the necessity to assess the identified 14 ward elements in the NHS hospitals. This exercise was completed through the post-occupancy evaluation of the three wards. With the aid of WEAT, a thorough evaluation of the characteristics of the hospital wards was conducted as presented in Chapter 7.

8.5 The Nursing Tasks and Environmental Assessment Framework

Guided by the conceptual framework, the Nursing Tasks and Environmental Assessment Framework (NTEA), was constructed from the results of empirical field investigations conducted throughout this PhD study. The NTEA Framework is not a blueprint; neither is it a set of guidelines, or rules to support workplace design in the healthcare setting. Rather, it is a model to be used by the stakeholders to better understand the physical characteristics of the workplace, the tasks that nurses perform and thereby, to ensure that the physical work space support the performance of the tasks for which they were designed; for all nurses irrespective of their age.

The NTEA Framework consists of two dimensions; namely, the nursing tasks dimension and the ward elements dimension. The nursing tasks dimension is operationalised by the Nursing Tasks Demand Matrix, while the ward elements dimension is assessed by the Ward Environment Assessment Tool. The main premise of the NTEA Framework is that an adequately designed ward environment would support nurses' four personal constructs and enable them to work safely in their job role. The NTEA Framework also posits that rather than focusing on the physical aspects of a job to determine a nurse's functional capacity, a better approach is to understand the nursing tasks, and design the work environment so it can contribute to the safe performance of these tasks. Hence, the Nursing Tasks Demand Matrix was presented as an alternative way to better understand nursing tasks (Chapter 5). With the aid of the Ward Environment Assessment Tool, post-occupancy evaluation of the hospital wards established the adequacy of the wards to support the four personal constructs of nurses (Chapters 6 and 7). The ultimate objective was to ensure a fit was achieved between the nursing tasks and the ward elements where these tasks activities are undertaken. Therefore according to the P-E fit theory, the 'P' is depicted by the nursing tasks, and is 'measured, through the Nursing Tasks Demand Matrix. The 'E' is represented by ward elements, and is measurable by the Ward Environment Assessment Tool (Figure 8.4).

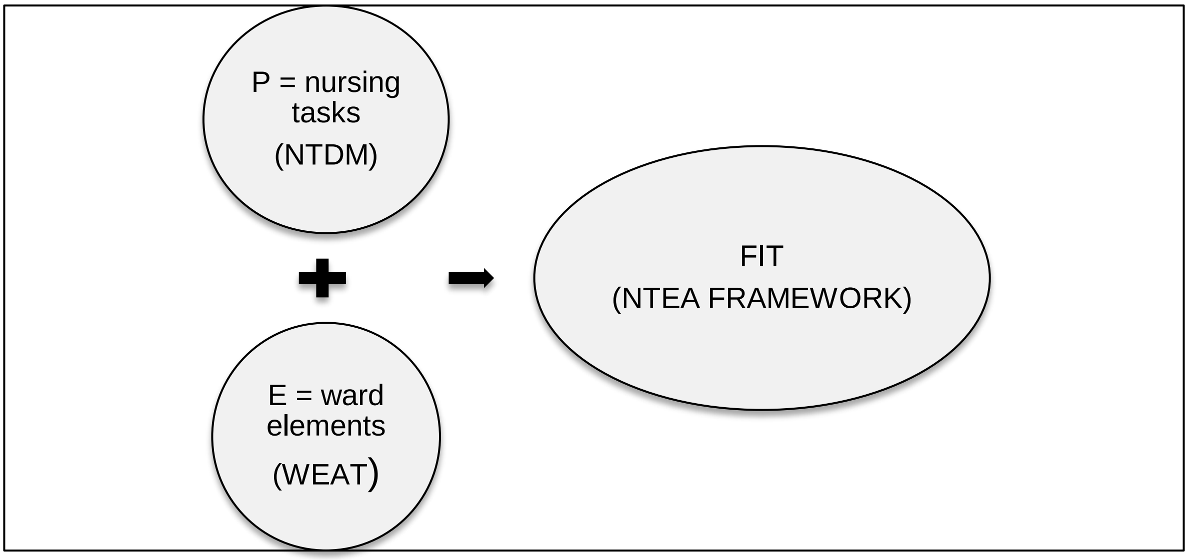


FIGURE 8.4: Fit Between Nursing Tasks and Ward Elements

This stage concluded the data collection process in the construction of the NTEA Framework, through field investigations. The following sections provide an elaborate account of the desk-based work undertaken to develop the Nursing Tasks and Environment Assessment Framework.

8.5.1 Mapping the Nursing Tasks with the Ward Elements

Twenty-three nursing tasks were identified, including 12 multilateral tasks and 11 unilateral tasks. In addition, 14 ward elements were identified as the most important spaces where these tasks are performed. The NTEA Framework is therefore supported by two underlying components; the Nursing Tasks Demand Matrix discussed in Chapter 5 and the Ward Environment Assessment Tool presented in Chapter 6. While both NTDM and WEAT may be used on a stand-alone basis, the NTEA Framework can only be used through the information fed into it by its two components (Figure 8.5). In its full functional form, the NTEA Framework is a complex system of a 'matrix', a 'tool' and a 'framework'.

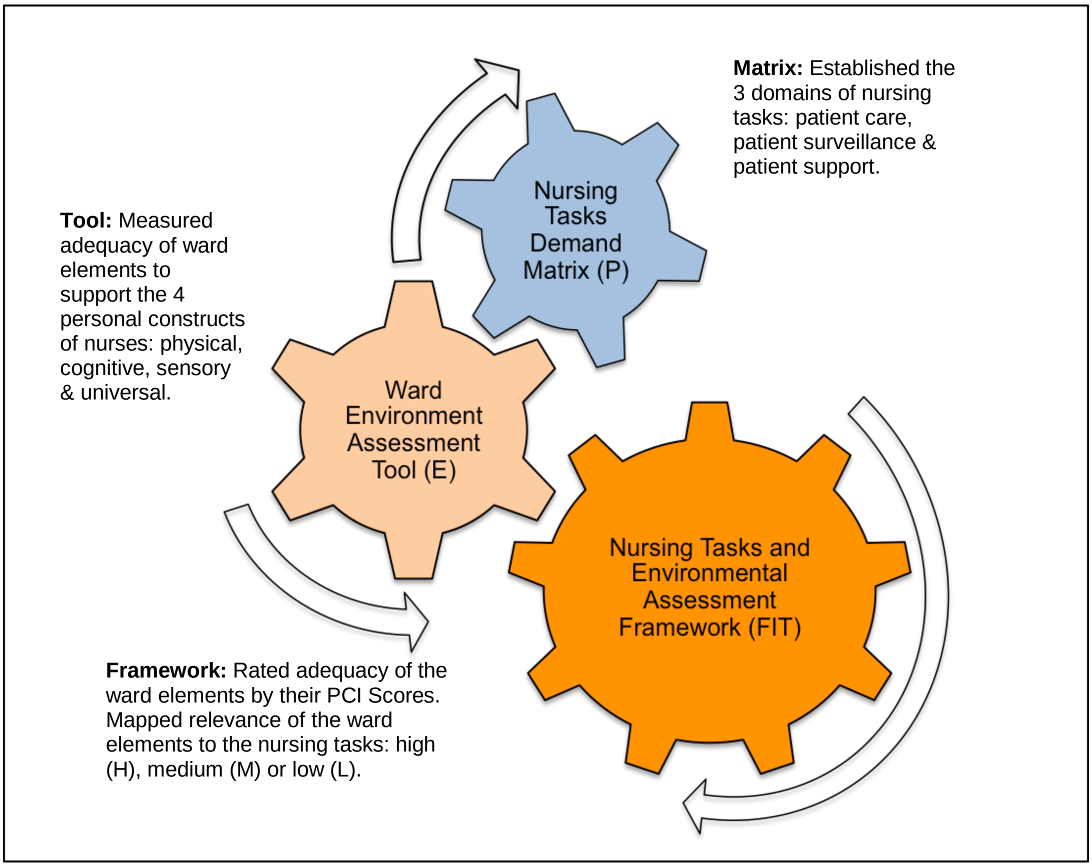


FIGURE 8.5: NTEA Framework Components Facilitating the Fit

To construct the NTEA Framework, it was presumed that not all the ward elements would be of equal relevance to each of the nursing tasks, i.e. some nursing tasks are more likely to be performed in certain ward elements than others. Therefore three levels of relevance were created for the ward elements, relative to the nursing tasks. The relevance of a ward element to a nursing task may be high (H), medium (M) or low (L). The relevance of a ward element to a nursing task is high (H) if the nursing task is designated to be carried out in that particular ward element. The relevance of a ward element to a nursing task is medium (M) if the nursing task is not designated to be carried out in that particular ward element; however, experience shows that such a task in practice may still be carried out in that ward element. The relevance of a ward element to a nursing task is low (L), if the nursing task in not designated to be performed in that ward element and if the ward element is inadequate for such tasks, even if it does happen in practice that such tasks are carried out in that ward element.

Based on the information gathered from the investigative interviews, each of the nursing tasks was mapped against each of the ward elements. As discussed in Chapters 6 and 7, respectively, both the lists of the ward elements and the nursing tasks were verified for completeness. Table 8.1 is an illustration of the mapping process, shown for the ward element 'nurse station'. For example, the task 'handover' is designated to be performed in the ward element 'nurse station'. Therefore, the relevance of the nurse station to handover is 'high' (H).

TABLE 8.1: Mapping the Ward Elements with the Nursing Tasks

	WARD ELEMENTS	Nurse Station	
NURSING TASKS		WE01	
	CODES	SUGGESTED	VALIDATED
Handover	TM1	H	
Medication	TM2	L	
Observation	TM3	L	
Feeding	TM4	L	
Personal care	TM5	L	
Moving & Handling	TM6	L	
Liaison	TM7	H	
Admission	TM8	H	
Discharge	TM9	M	
Pre-operation	TM10	L	
Post-operation	TM11	L	
Specific Risk Assessment	TM12	M	
General Risk Assessment	TU13	M	
Watching	TU14	H	
Documentation	TU15	H	
Ward rounds	TU16	L	
Coordination	TU17	H	
Psychological Support	TU18	L	
Walking	TU19	L	
A&E Clinic	TU20	L	
Answer Patient Buzzer	TU21	H	
Telephone	TU22	H	
Engage & Teach Student Nurses	TU23	H	

Colour legend:	
	HIGH (H)
	MEDIUM (M)
	LOW (L)

Likewise, the nurse station is given a medium (M) relevance with respect to the task 'discharge', which suggests that while patients may be discharged in the nurse station, this ward element was not originally designed for this purpose; and it is neither unsafe nor inappropriate to perform this task in this space. In case of the nursing task 'psychological support', the ward element nurse station is presumed to be of low relevance, because this space is not designed for this types of tasks and it is not appropriate to offer patients this type of service in this ward element either. Undertaking this type of task in this space may be portraying a lack of privacy and dignity for patients, which undermines the professional standard of nursing practice. The results of the mapping exercise were recorded in the column "SUGGESTED". This exercise was conducted for each ward element in the three hospital wards in which POE survey was undertaken using WEAT. The column "VALIDATED" was created and left blank as it was intended that a follow up focus group would be conducted to validate the results with the stakeholders of the NTEA Framework.

8.5.2 Validation of Results

As discussed in Chapter 3 under research methodology, embedding rigour in qualitative research is not as straightforward as in quantitative studies. Barbour (2001), for example, suggested that in the construction of the research results, respondent validation is a useful means of corroborating and refining the research findings. This requires that the researcher presents the findings of the study to those participants from whom the data had been generated and inviting them to verify if the respondents' views are reflected in the research findings. By so doing, consistency of information is guaranteed and the risk of misinterpretation is eliminated or reduced. The results of the mapping exercise presented in Table 8.1, was subsequently shown to stakeholders for validation in focus group setting. (Please see Figure 8.6 for a picture taken during the validation session). As already discussed in Chapter 5, the validation focus group was conducted to achieve two major objectives. The first objective was to validate the Nursing Tasks Demand Matrix in Chapter 5. The second objective was to validate the Nursing Tasks and Environmental Assessment Framework. The validation process is presented in the following sections.

FIGURE 8.6: Participants during Focus Group Validating Session

8.5.2.1 Purpose of Validation

The main purpose of validation was for the stakeholders to verify that the mapping of the ward elements with the nursing tasks as conducted by the researcher, was a true reflection of the nursing practice within the NHS case hospital wards. The same applies to the mapping of the Nursing Tasks Demand Matrix. As discussed in Section 3.14 (please see also Figure 3.5) in Chapter 3, this stage is a crucial part of the research process because the stakeholders are the professionals that would eventually be using and implementing the framework; therefore their 'quasi' consent on the parameters of the NTEA Framework is very important.

8.5.2.2 Participating Stakeholders for the Validating Focus Group

The primary focus of the NTEA Framework is to create a fit between ward nurses' capacity and their physical practice environment. Therefore ward nurses are the key group of beneficiaries of the NTEA Framework. Additionally, it was important to have a balanced representation of nurses and other stakeholders that would be using the NTEA Framework. Therefore for the purpose of the validation, six stakeholders were invited to the focus group. In order to ensure there is continuity of participants across each stage of the data collection, four out of the six stakeholders invited to the validation focus group had previously been interrogated at one or more of the earlier stages of the study and have contributed to the data collection process. Table 8.2 presents a short profile of the participants that were invited to the validation focus group, who have been coded PV1, PV2, PV3, PV4, PV5 and PV6, respectively. The table shows the participants' job title, length of service with NHS, the department where they worked, and whether they had previously participated in the study or not.

TABLE 8.2: Profile of Validating Focus Group Participants

Participants	Job Title	Length of service in NHS (years)	Department	Previous participation in study (Yes/No)
PV1	Midwife	33	Maternity	No
PV2	Senior HCA	35	Upper Gastrointestinal Ward	Yes
PV3	Research nurse	28	Neuroscience and Dementia Research	Yes
PV4	Research nurse	16	Paediatric Research & Innovation	No
PV5	HR Manager	10	Human Resource Management	Yes
PV6	Facilities Manager	14	Estate Management	Yes

As had been previously practised in this PhD study, the Facilitator within the NHS helped to recruit participants for the validating focus group, which was scheduled to take place at the premises of the NHS.

8.5.2.3 Introduction to the Validation Process

On the agreed day of the validation focus group, the researcher visited the NHS premises. The researcher was accompanied by a colleague, who assisted with some of the practicalities of the validation session. For example, by ensuring that each participant had read the participant information sheet and had signed the consent form. However, this colleague did not interfere in any materially significant way to influence the outcome of the validation. The validation process was completely facilitated by the researcher.

At the beginning of the session participants were informed that the session would be audio-video recorded for the purpose of transcription and analysis. However, the researcher noted that no personal information or identifiable images would be featured in any public domain. Participants were asked if they had any concerns about their voices or images being recorded. None of the participants raised any objections to the audio-video recording of the session. While audio recording the session would have been sufficient in itself to aid the understanding of the group dynamics during the focus group session, the video, was an addition, that helped the researcher to corroborate verbal utterances with body language so as to discern the point a participant was making. However, participant behaviour did not form part of the data analysis. After each participant had evidenced their voluntary participation in the study by signing the consent form, the researcher then asked participants if they had any other questions. None of the participants had further questions. The researcher then commenced the validation process by giving a short power point presentation of the findings of the research to date and highlighted the objectives of the validation focus group.

8.5.2.4 Subdividing the Focus Group

The participants were subdivided into two groups, namely the Tasks group and the Environment group. This subdivision was based on the individual participant's profile (as shown in Table 8.2). The Tasks group consisted mainly of practising nurses, who were presumed to have a thorough knowledge of the nursing tasks. Hence this group undertook the validation of the Nursing Tasks Demand Matrix discussed in Chapter 5. So the midwife (PV1), the senior healthcare assistant (PV2), and the neuroscience and dementia research nurse (PV3) were asked to work together in the Tasks group on the Matrix. The Environment group consisted of the paediatric research nurse (PV4), the human resource manager (PV5) and the facilities manager (PV6). While the facilities manager, as part of his responsibility to manage NHS estates, could contribute through his knowledge of how spaces are designed and used, the human resource manager was expected to contribute to this validation process through her knowledge of designing job descriptions and specifying job requirements. The presence of the paediatric nurse in this Environment group ensures that the group discussion and consensus took account of the nuances of nursing practice. The subdivision enhanced the optimisation of tapping into participants' knowledge most relevant to nursing tasks and work environment. As the activities of the Tasks group had already been presented in details in Chapter 5, the following sections focuses on the activities of the Environment group in the validation session.

8.5.2.5 Validating Nursing Tasks and Environmental Assessment Framework

The researcher handed out a copy of the prepared table consisting the NTEA Framework to each member of the Environment group. Please see Table 8.3 for a sample of the working sheet for the validation of the NTEA Framework. The researcher explained to the participants what was expected of them. Participants were asked to map each of the nursing tasks against each of the ward element, based on the relevance of the ward element to the nursing task, as discussed in section 8.4.1 above. They should indicate the relevance of each ward element to each of the nursing tasks; i.e. if the relevance of a ward element to a nursing task was high (H), medium (M) or low (L). Participants were asked to perform this activity first individually, by recording their understanding of the correlation between nursing tasks and the ward elements in the column "VALIDATED" in Table 8.3. After performing this exercise individually, participants were then requested to work as a group, and based on their consensus, they should record the group opinion in a separate table. This approach gave the researcher the possibility to compare individual opinions with group consensus. The group consensus could then be compared with the researcher's "original" results of the mapping process discussed in section 8.4.1 above.

8.5.2.6 Validating Nursing Tasks Demand Matrix

The full list of the nursing tasks with the "SUGGESTED" PNI domain was presented to the stakeholders in the validation focus group session. Table 8.4 is an excerpt of the validation sheet, showing the tasks 'handover' and 'medication'. The focus group consisted of 6 people of various professional background. The group was divided into two subgroups: a 'Task' and an 'Environment' group. The three nurses in the Task group were invited to record their understanding of the relationship between each of the nursing tasks and the PNI domain. Based on the given definitions of each of the PNI domains and record their understanding of the relationship between each of the nursing tasks and the PNI domain in the "VALIDATED" column of the sheet. They should perform this activity first individually, then agree on a group consensus, which should then be recorded in a separate sheet, labelled 'Group'.

8.5.2.7 Mapping Correlations

The Environment group results for the relevance of ward elements to nursing tasks recorded in the 'VALIDATED" column were compared to the results proposed by the researcher which were pre-recorded in the "SUGGESTED" column. In order to obtain the final level of relevance, the Environment group validation were accepted. When there was just one 'level' discrepancy between the suggested and the validated relevance level, then the Environment group result was accepted as final. For example, if the researcher suggested that the relevance of the ward element to a nursing task was 'High' and the Environment group validated it as 'Medium', then 'Medium' would be accepted as the final level of relevance. However, in instances where the discrepancy is more than one level, these were highlighted and shaded in the work sheet of the NTEA Framework for further exploration and explanation. For example, if the researcher recorded a relevance of 'High' and the Environment group recorded 'Low' for the same permutation of ward element and nursing task relevance, these were shaded and followed up. The product of the 14 ward elements and 23 nursing tasks (14 X 23) is 322. This means there are 322 cells in the NTEA Framework that represent each permutation of the ward elements with the nursing tasks. However, there were only eight instances, when the researcher's suggested level of relevance showed two levels of discrepancy, compared to what the stakeholders eventually validated. These eight instances compared to the total of 322 is only 2.45% of the total cases, which demonstrates a high level of correlation. Nevertheless, it is the focus group validated relevance level that prevailed in each case of nursing task and ward element. The relevance levels validated by the Environment group were thus incorporated into the final NTEA Framework.

TABLE 8.3: Validating sheet of the Nursing Tasks and Environmental Assessment Framework

Ward Elements	Nurse Station		Patient Bay		Side Room		Staff Room		Ward Manager's Office		Doctor's Office		Day Room		Corridor		Storage Room		Clean Utility		Sluice		Bathroom & WC		Kitchen		Entrances & Exits	
Nursing tasks	SUGGESTED	VALIDATED	SUGGESTED	VALIDATED	SUGGESTED	VALIDATED	SUGGESTED	VALIDATED	SUGGESTED	VALIDATED	SUGGESTED	VALIDATED	SUGGESTED	VALIDATED	SUGGESTED	VALIDATED	SUGGESTED	VALIDATED	SUGGESTED	VALIDATED	SUGGESTED	VALIDATED	SUGGESTED	VALIDATED	SUGGESTED	VALIDATED	SUGGESTED	VALIDATED
Handover	H		H		H		M		H		H		L		M		L		L		L		L		L		L	
Medication	L		H		H		L		M		M		L		M		H		H		L		L		L		L	
Observation	L		H		H		L		L		L		M		M		L		L		L		H		L		L	
Feeding	L		H		H		L		L		L		H		L		L		L		L		L		M		L	
Personal care	L		H		H		L		L		L		L		L		L		L		L		H		L		L	
Moving & Handling	L		H		H		L		L		L		H		H		M		M		M		H		M		H	
Liaison	H		L		L		H		H		H		L		L		L		L		L		L		L		L	
Admission	H		H		H		L		L		L		L		L		L		L		L		L		L		L	
Discharge	M		H		H		L		L		L		L		L		L		L		L		L		L		L	
Pre-operation	L		H		H		L		L		L		L		L		L		L		L		L		L		L	
Post-operation	L		H		H		L		L		L		L		L		L		L		L		L		L		L	
Specific Risk Assessment	M		H		H		L		L		L		L		L		L		L		L		L		L		L	
General Risk Assessment	M		H		H		L		L		L		L		L		L		L		L		L		L		L	
Watching	H		H		H		M		M		M		H		H		L		L		L		M		M		H	
Documentation	H		H		H		M		H		H		M		M		H		H		L		L		L		L	
Ward rounds	L		H		H		L		H		H		L		L		L		L		L		L		L		L	
Coordination	H		L		L		M		H		H		M		M		L		L		L		L		L		L	
Psychological Support	L		H		H		L		L		L		H		L		L		L		L		M		L		L	
Walking	L		M		M		M		M		M		M		H		M		M		M		M		M		H	
A&E Clinic	L		L		L		L		M		M		L		L		L		L		L		L		L		L	
Answer Patient Buzzer	H		H		H		L		H		H		H		M		L		L		L		M		L		M	
Telephone	H		L		L		L		H		H		L		M		L		L		L		L		L		L	
Engage & Teach Student Nurses	H		M		M		M		H		L		L		H		M		M		L		M		M		L	

TABLE 8.4: Excerpt of the Validating sheet of the Nursing Tasks Demand Matrix

Task Code	Tasks	Subtasks list	SUGGESTED Patient-Nurse Interaction			VALIDATED Patient-Nurse Interaction		
			Care	Surveillance	Support	Care	Surveillance	Support
TM01	Handover	walk from patient to patient	✓	✓	✖			
		discuss each patient case	✓	✓	✓			
		info transfer between night and day staff	✓	✓	✓			
		inquire about patient wellbeing	✓	✓	✓			
		compare patient charts with physical observations	✓	✓	✖			
TM02	Medication	affix cannulation	✓	✓	✖			
		affix drips	✓	✓	✖			
		calculate drip rate	✓	✓	✖			
		calculate drug dosage	✓	✓	✓			
		confirm drug allergy	✓	✓	✓			
		perform medication rounds	✓	✓	✓			
		check control drugs	✓	✓	✓			

8.5.2.8 Inputting the PCI Scores in the NTEA Framework

As discussed above, while the Nursing Tasks Demand Matrix and the Ward Environment Assessment Tool, may be used on a stand-alone basis, their primary purpose is to support the implementation of the NTEA Framework. Furthermore, creating a fit between nurses' capacity and their work environment requires that the PCI scores, derived from the post-occupancy evaluation of the three wards discussed in Chapter 7, be operationalized in the NTEA Framework. This is because it is the PCI scores that provide the 'objective' assessment of the functional fit of the ward elements for the nursing tasks for which they were designed and built. Therefore it is imperative for the results of the POE to be incorporated into the NTEA Framework.

Table 8.5 is the final outcome of the NTEA Framework, after inputting the PCI scores for each of the ward elements of the three wards (namely, Ward A, Ward B and Ward C) in the appropriate rows at the top of the table. In this case the PCI scores of each ward element for each of the three wards are inputted in the table. To aid a better understanding and analysis of these NHS wards, the ward elements have been grouped into four categories according to their PCI scores, and have been colour-coded accordingly.

The four categories are:

(i) 75% and above: Excellent
(ii) Up to 65% and below 75%: Good
(iii) Up to 55% and below 65%: Adequate
(iv) Less than 55%: Suboptimal

The categorisation and colour coding of the ward elements into these four categories enables easy identification of problem areas on the ward, and therefore enhances the implementation of the NTEA Framework.

TABLE 8.5: NURSING TASKS AND ENVIRONMENTAL ASSESSMENT FRAMEWORK

		WARD ELEMENTS	Nurse Station	Patient Bay	Side Room	Staff Room	Ward Manager's Office	Doctor's Office	Day Room	Corridor	Storage Room	Clean Utility	Sluice	Bathroom & WC	Kitchen	Entrances & Exits
		PCI SCORES WARD A	79.41%	78.05%	72.62%	66.67%	71.43%	72.73%	70.18%	61.82%	51.85%	63.64%	73.68%	74.58%	56.25%	85.00%
		PCI SCORES WARD B	78.46%	72.15%	63.51%	74.36%	77.78%	82.35%	67.86%	60.78%	60.00%	65.12%	85.71%	78.95%	75.76%	85.71%
		PCI SCORES WARD C	77.27%	78.21%	67.86%	71.79%	77.14%	74.19%	45.61%	67.27%	60.00%	64.44%	71.43%	66.07%	82.86%	82.61%
NURSING TASKS		CODES	WE01	WE02	WE03	WE04	WE05	WE06	WE07	WE08	WE09	WE10	WE11	WE12	WE13	WE14
Multilateral Tasks	Handover	TM1	H	H	H	M	M	H	L	L	L	L	L	L	L	L
	Medication	TM2	L	H	H	L	L	H	L	L	L	H	L	L	L	L
	Observation	TM3	L	H	H	L	L	L	M	L	L	L	L	L	L	L
	Feeding	TM4	L	H	H	L	L	L	M	L	L	L	L	L	L	L
	Personal care	TM5	L	H	H	L	L	L	L	L	L	L	L	H	L	L
	Moving & Handling	TM6	L	H	H	L	L	L	H	H	H	L	M	H	M	H
	Liaison	TM7	H	H	H	H	H	H	M	M	L	L	L	L	L	L
	Admission	TM8	H	H	H	L	H	L	L	L	L	L	L	L	L	L
	Discharge	TM9	M	H	H	L	M	L	M	M	L	L	L	L	L	L
	Pre-operation	TM10	L	H	H	L	L	L	L	L	L	M	L	L	L	L
	Post-operation	TM11	L	H	H	L	L	L	L	L	L	L	L	L	L	L
	Specific Risk Assessment	TM12	M	H	H	L	L	L	M	M	L	L	L	L	L	M
Unilateral Tasks	General Risk Assessment	TU13	M	H	H	L	M	L	M	M	L	L	L	L	L	L
	Watching	TU14	H	H	H	L	L	L	H	H	L	L	L	M	L	M
	Documentation	TU15	H	H	H	L	H	H	M	M	L	H	L	L	L	L
	Ward rounds	TU16	L	H	H	L	M	H	L	M	L	L	L	L	L	L
	Coordination	TU17	H	M	M	L	H	H	L	M	L	M	L	L	L	L
	Psychological Support	TU18	L	H	H	L	L	L	H	M	L	L	L	M	L	M
	Walking	TU19	L	M	M	L	L	L	M	H	L	L	L	L	L	H
	A&E Clinic	TU20	L	L	H	L	L	L	L	L	L	L	L	L	L	L
	Answer Patient Buzzer	TU21	H	H	H	L	H	H	H	L	L	L	L	M	L	L
	Telephone	TU22	H	L	L	L	H	H	L	M	L	L	L	L	L	L
	Engage & Teach Student Nurses	TU23	H	H	H	M	H	M	M	H	M	H	M	M	M	L

COLOUR LEGENDS:			
	PCI SCORE CATEGORIES	WARD ELEMENT RELEVANCE	
EXCELLENT	ABOVE 75%	H	HIGH
GOOD	UP TO 65% AND BELOW 75%	M	MEDIUM
ADEQUATE	UP TO 55% AND BELOW 65%	L	LOW
SUBOTPIMAL	BELOW 55%		

8.5.3 Stakeholders of the NTEA Framework

So far this study had demonstrated the novel rationale behind the development of the NTEA Framework: creating a fit between ward nurses and their work environment. Participants across various professions were recruited and interrogated at each stage of the research project. These participants represented those professions within the NHS that may potentially benefit from the Framework. This list includes facilities management; occupational health department; human resource management; ward managers and matrons; NHS management and ward nurses and healthcare assistants. Personnel in this group are called the internal or primary stakeholders. The NTEA Framework has the scope and potential to be used in a broader range of settings, such as by NHS contractors, governmental sectors and researchers of NHS estate and facilities. These are the external or secondary stakeholders. However, since this study has focussed on the primary stakeholders only, the following sections have highlighted the five internal stakeholders that could be interested in the application of the NTEA Framework. Exploring the benefits of the external stakeholders is beyond the scope and remit of this PhD project.

8.5.3.1 Human Resource Management

One of the functions of human resource management is drafting and implementing job descriptions for personnel in various job roles and positions in an organisation. Conventionally, human resource management approach to job description design usually takes two forms, namely, person orientated or task orientated. The person-orientated approach specifies the person traits and capabilities, while stating the essential and desirable criteria necessary to qualify for the position. The task-orientated approach, on the other hand, states the nature and the characteristics of the tasks to be performed by the job applicant. While the person-orientated approach to designing job description focuses on the person and the potentials of the person to develop, the task-orientated approach attempts to objectify the recruitment process by focusing more on the tasks and less on the person. One of the most salient shortcomings of the two approaches is that they both ignore the importance of context. For instance, Urden and Roode (1997) opine that nursing staff efficiency and productivity are key factors in managing human resources in the healthcare setting, and the absence of appropriate data could lead to suboptimal decisions with detrimental outcomes.

Human resource managers could use the NTEA Framework to provide appropriate context when drawing up a job description. An assessment of the ward environment with the aid of WEAT, would provide valuable information on the context where the tasks in the job description would be undertaken. Thereby, a decision could be made whether adjustments to the job design, the physical workspace (ward element) or even the exemptions of the nurse from certain tasks may be necessary, if this is feasible and in line with the organisation’s policy. This novel approach offered by the NTEA Framework relegates conventional practice of one-size fits all, which is an attempt to treat every job applicant or incumbent as ‘equal’, and in which, whenever it is uncovered that this approach does not work, an overhaul of the system is conducted and costly refurbishment of healthcare facility is ordered, whereas a subtle modification might have achieved more effective results.

8.5.3.2 Facilities Management

Facilities management is defined as the "…application of integrated techniques to improve the performance and cost effectiveness of facilities to support organisational development" (Igal and Sarel, 2004, p. 211.). Facilities management have both an operational and a strategic role in how the NHS estates are designed, managed and used. While UK facilities managers have been strongly criticised for being task-focussed and operating in the reactive, fire-fighting mode (Eley, 2001), the need for facilities management to be more proactive and strategic in its approach to estate management is becoming more prevalent, especially for FM managers in charge of complex buildings such as hospitals. One of the central tenets of the NHS is to deliver "…high quality care that is safe, effective and focused on patient experience…" (Department of Health, 2015). This, however, must be supported by a forward-looking and responsive facilities management, which integrates non-clinical services such as efficient space usage, cleaning, security, catering and maintenance (Heng et al., 2005). By understanding the nuances of the nursing practice environment, facilities management could support ward managers to determine space requirement and optimisation on wards. For example, the multifunctional use of space that was discussed in Chapter 7, regarding the Day Room in Ward C, demonstrates how crucial the role of facilities management is, when a ward element is used for multiple purposes. While this practice is very uncommon, it cannot be completely eliminated. Making a ward element multifunctional due to space shortage should not compromise basic work ethics or undermine patient right to privacy and dignity.

Facilities managers may implement the NTEA Framework to facilitate spatial design and usage in order to ensure the needs of both patients and nursing staff are met in the multifunctional use of space. Convertible or multipurpose furnishing, spatial demarcation, flexible lighting and enhanced noise insulation, may resolve some of these problems, instead of a complete and costly renovation, that could temporarily disrupt the care process on the ward.

8.5.3.3 Occupational Health Department

The single most common physical nursing task associated with work-related injuries is moving and handling of patients (Pompeii et al., 2009, Hinton, 2010). Occupational health advisors are routinely requested to conduct pre-employment assessment of job applicants and the fitness of employees to return-to-work after illnesses and injuries which might have been due to job-related tasks or not (Waddell and Burton, 2001). As discussed in Chapter 5, such an assessment may require occupational health advisors to 'determine the functional capacity' of the ward nurse. The shortcomings of the traditional approaches to determine a nurse's functional capacity were discussed in details in Chapter 5. The question is how occupation health department may take a novel approach to determine if a person is fit for work or not rather than the traditional methods of the physical assessment of the person, without much regard for the work environment.

Beyond the physical aspects of the nursing tasks, occupational health advisors may better understand the nursing practice regarding the impacts the work environment has on cognitive, sensory and universal constructs of nurses. While this may not be readily gleaned from the results of the NTEA Framework itself, the underlying PCI score of a ward element, is indicative of the cumulative effects of the ward element on the four constructs of the nursing staff. Further, exploration of the WEAT results would establish the interplay between the ward elements and all the personal constructs, and thereby a more adequate evaluation of the fit between the nurse and the work environment may be facilitated.

8.5.3.4 Ward Managers and Matrons

Ward managers and matrons are responsible for the daily management of the ward activities. They manage both the human and material resources required for the day-to-day operation of the ward. Acknowledging the importance of ward managers as frontline managers in the NHS, Hutchinson and Purcell (2010) reiterated that these healthcare professionals are increasingly part of the more strategic human resource management and workforce projection and planning within most NHS organisations. With valuable information at ward managers' disposal in their position as frontline managers, Hutchinson and Purcell (2010, p. 358.) argue that they "…have the potential to significantly influence employees attitudes and behaviours". Under-resourced ward managers may be experiencing job-related strains, if they are unable to motivate their employees for reasons attributable to misfit between the job design and the work environment.

The NTEA Framework could be a useful management decision-making tool in these circumstances. Ward managers may use the NTEA Framework to project their workforce requirements, as they would know the age distribution and the personal construct limitations of their nurses, and be very much aware of the conditions and adequacy of the ward elements where the nursing tasks are performed. By implementing the NTEA Framework, ward managers, may be able to inform facilities managers about necessary modifications to the spaces in the ward or work together with the occupational health department or human resource management to make adjustments to job design. Ward managers would also have the information that could support such decisions as the necessity to redeploy an older nurse, if desirable.

8.5.3.5 Ward Nurses

Lastly, the most important stakeholders are the beneficiaries of the NTEA Framework, that is, ward nurses. While ward nurses might not be in a position to make managerial decisions, they would be very much interested in how their personal constructs continue to evolve in their job role and to what extent their physical work environment offer adequate support for them to maintain their functional capacity. As discussed in Chapter 7, there is a newly emerging trend in the nursing practice environment within the NHS. Increasingly, NHS hospital wards are introducing mobile nurse stations, which may redefine the way nurses relate to the physical workspace in the future. While this initiative is at its early stage, there is profound evidence to suggest that NHS is inclined to taking the treatment to the patients rather than moving patients from on procedure to another.

Ward nurses, therefore may be interested in the ergonomic build of these computerised mobile nurse stations, as this may require them to work longer while standing. The way nursing tasks are designed with respect to tasks requiring the mobile nurse stations on lectern would become crucial in this new setting. Nursing tasks such as documentation that have been performed in a sitting position may now need to be undertaken while standing at the lectern. This would have ramifications not just for the ward nurses, but also for the facilities managers in terms of space design and requirements or for occupational health advisors when assessing functional capacity with respect to if a task is performed in a sitting or a standing position.

8.5.4 Application Stages of the Nursing Tasks and Environmental Assessment Framework

The NTEA Framework is a complex model that can be used to create a fit between ward nurses' capacity and their work environment. While the previous sections discussed the stakeholders and what they might use the NTEA Framework for, the following sections focus mainly on the implementation areas of the framework; i.e. how it can be used and managed in four stages of a building lifecycle. First, it is important to note that the NTEA Framework is not a static model. Depending on the setting and evolution of the nursing practice environment, it might be necessary to fine-tune some of the components. While the NTEA Framework embodies well-established design standards, conforms to regulatory requirements and is founded on evidence-based research, it also affords a reflexive approach, adaptable to newer settings.

The NTEA Framework consists of two dimensions. The first is the nursing tasks dimension, which has been annotated the 'independent variable'. Essentially, this means that in most cases, the nursing tasks dimension of the NTEA Framework would be given. The implementer of the framework need not input any parameters in this dimension of the NTEA Framework in order to implement the framework. This also applies to the underlying components of the NTEA Framework, including the definition of nursing tasks as multilateral or unilateral in the Nursing Tasks Demand Matrix. The nursing tasks, with regard to the degree of the interaction with patient would also be given. The domains of the patient-nurse interaction; i.e. patient care, patient surveillance and patient support would be given, and may not necessarily vary across hospital wards, NHS estates, or Trusts. Even when the fine adjustments of some of the elements of the independent dimension of the NTEA Framework are necessary, in order to reflect local conditions and circumstances, such modifications would not have profound impacts on the principles of the NTEA Framework. This is because the approach to undertaking certain nursing tasks have been standardised and are regulated by NHS protocols, which nurses must adhere to irrespective of where they are located (Department of Health, 2015). Therefore, while a researcher using a case study as an approach to investigating a research question must be cognisant of the limitations of generalisation, the fact NHS standards and values are valid across

Trusts and regions, means the NTEA Framework could be transposed and applied within any NHS hospital ward setting.

The other dimension of the NTEA Framework is the ward elements dimension, which has been termed the ‘dependent variable’. This is because, while nursing standards and protocols may be uniform in various settings within the NHS, the physical work environment would be different. Therefore, the implementer of the NTEA Framework must take account of the local environment and capture the nuances of the local settings. This is where the Ward Environment Assessment Tool plays a crucial role. To understand the characteristics of all the ward elements requires that the implementer of the NTEA Framework conduct the walkthrough POE survey of the ward environment, using the WEAT checklist. While the design of NHS estates is regulated by certain standards, such as the Health Building Notes (Department of Health, 2013), design and build contracts may make building realities less obvious. In addition, as it has been highlighted during the POE in Chapter 7, there may be a discrepancy between what a ward space was functionally designed and built for and what it is actually used for in reality. The POE walkthrough exercise would capture these variances and take account of them in its evaluation of space adequacy. Furthermore, by differentiating ward elements according to their relevance to the tasks they are expected to functionally support, the three levels of relevance (high, medium and low), allows for local circumstances to be better pronounced in the implementation of the NTEA Framework. Please see Figure 8.7 for an illustration of the implementation stages of the NTEA Framework.

It is the combined strengths of thorough understanding of the independent variables offered by the Nursing Tasks Demand Matrix, coupled with the efficacy of the dependent variable, achieved with the support of the Ward Environment Assessment Tool, that make the NTEA Framework a novel model that has made original contribution to knowledge, based on the premise of the person–environment fit theory. The NTEA Framework may be used in four stages in a building lifecycle, namely, design, use, management and review. These stages are not necessarily linear, but denote the building lifecycle stages where intervention may be necessary and at which points the NTEA Framework may contribute to the seamless management of the stage. The following sections present the implementation stages of the NTEA Framework in a building lifecycle.

8.5.4.1 Design

It has long been established in the Architecture, Engineering and Construction industries that most of the building errors and related wastes may be eliminated through design and at the design stage of the building lifecycle (Osmani et al., 2008, Boothroyd, 1994). The building procurement process may now rely on the technological advances offered by computer-aided designs (Bouchlaghem et al., 2005) and the building information modelling (Vanlande et al., 2008). Facilities management are the ‘in-house’ architects of an organisation, and as the ultimate managers of the facilities, they should play a more concerted role in the procurement process (Heng et al., 2005). This means involving facilities managers at the design and conceptualisation stage of the building procurement process, be it an upgrade refurbishment or new build.

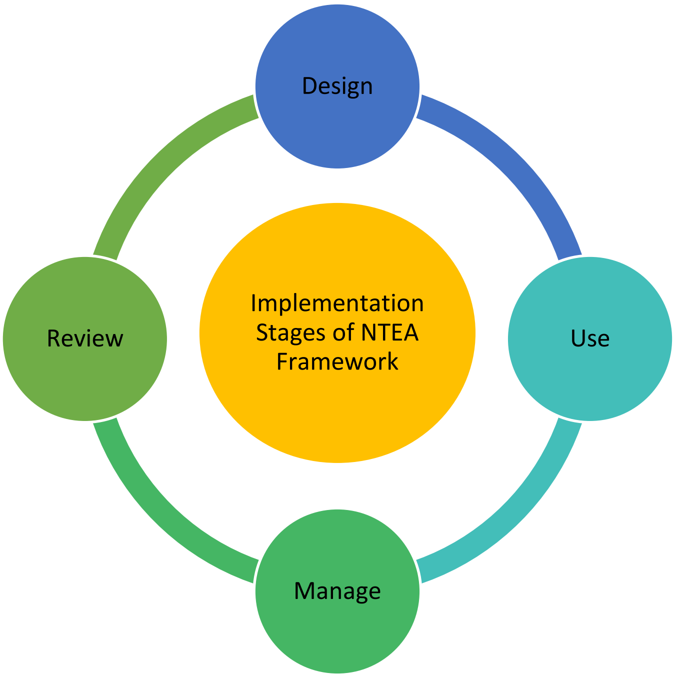


FIGURE 8.7: implementation Stages of the NTEA Framework

FM managers may use their knowledge of implementing the NTEA Framework to foster collaboration with other members of the design teams. In a new build project, for example, the independent variables of the NTEA Framework may be presented to show the multifarious nature of a multilateral nursing task and the potential impacts the design of a ward element may have on the personal constructs of a ward nurse while performing such tasks. The presentation of this kind of research evidence increases the credence of facilities management within the organisation, and can be quantified in financial terms, as it is opposed to design practice based on routine.

8.5.4.2 Use

The ultimate objective of any building is to fulfil the needs of its users. In addition, the benefits of involving end-users at the early stages of the building procurement process have been widely publicised (Duffy et al., 1992). That being said, it is highly unlikely that the future users of healthcare facilities would be queried about their preferences during the procurement process. While there has been a marked change in the trend and work ethics and approaches to work today than a few decades ago, the buildings where healthcare personnel work have remained virtually the same. Retrospective refurbishments of old building structures have done little justice to remove the remains of rigid and stereotypical work culture now abhorred by contemporary healthcare workers. For example, the mobile nurse stations discussed in Chapter 7, as a new initiative and approach to health services provision to patients, have been installed without any significant change to the ward layout where these new workspaces are now situated. In such circumstances there is bound to be a tension between space as designed and space as used.

The NTEA Framework could be instrumental in this transition period of change to spatial usage of ward elements. The NHS Trust management may be able adapt some of the parameters of the dependent variables of NTEA Framework, by conducting a POE walkthrough of the wards prior to implementing this initiative of mobile nurse station, in order to assess its potential efficacy.

8.5.4.3 Manage

The management of healthcare facilities requires a tremendous amount of resources from the NHS. Igal and Sarel (2004) recognise five core domains of facilities management in the healthcare sector spanning activities such as maintenance management, performance management, risk management, supplies services management, and development. To fulfil these multidisciplinary requirements, facilities management experts must be adept and up to date on issues pertinent to healthcare facilities. A number of studies have demonstrated the contribution made by facilities management for the NHS to deliver effective healthcare services (Stipanuk and Roffmann, 1992, Gelnay, 2002). NTEA Framework may serve as a tool to gather information on the NHS estates so that informed decisions can be made.

8.5.4.4 Review

Finally, NHS estates constitute a significant part of the NHS and the UK's national wealth. As a public organisation the preservation and management of these capital assets is bound to constitute part of socio-political discourse across the political spectrum. It would be necessary to review the performance of these healthcare facilities, benchmarking them against acceptable key performance indicators. The NTEA Framework, with the aid of WEAT, could form part of a more comprehensive review of NHS estates stock.

8.5.5 Implementing the NTEA Framework

To implement the NTEA Framework, it is important to understand its fundamental principles. This will be reiterated in this section. First, the Nursing Tasks Demand Matrix has established the characteristics and the nature of the various nursing tasks, with respect to the patient-nurse interaction discussed in Chapter 5. Three domains of patient-nurse interactions were identified, depending on the depth of the interaction required by the nurse with the patient or other interested parties in the patient therapeutic healing process. The three domains are patient care, patient surveillance and patient support. Furthermore, the classification of nursing tasks into multilateral and unilateral tasks has enabled a better understanding of the nuances of the nursing practice environment on hospital wards. The nursing tasks dimension would be termed the 'independent' or 'fix' variable of the NTEA Framework, as it would be given and mostly uniform across wards, ward elements and hospital facilities, provided the same or similar environmental condition can be replicated.

Secondly, the Ward Environment Assessment Tool contributes to the NTEA Framework, through the PCI scores. The PCI scores, on the other hand, have been obtained from a rigorous evaluation of the ward elements through more than 700 architectural design features collected from design standards, existing assessment instruments used in other similar settings and, most importantly, information gathered from the nursing staff themselves, as discussed in Chapter 5. These architectural design features have been allocated to assess how the ward elements support ward nurses in the four personal constructs (namely physical, cognitive, sensory and universal), which have been established to be essential for nurses to perform their duties, and can be positively or adversely impacted by the physical work environment. The PCI scores, establish the adequacy of the ward to support nurses' four personal constructs, by conducting a POE walkthrough with the aid of WEAT. The ward elements dimension, objectified in the PCI scores, is termed the 'dependent' variable, as it would be different for every ward and setting.

Thirdly, mapping the ward elements against the nursing tasks based on their relevance levels enables the implementer of the NTEA Framework to identify and focus attention on the critical areas on the wards. The critical areas are those ward elements that have obtained very low the PCI scores, on the one hand, and which, however, have been deemed to be of high relevance to a certain task, on the other hand. For example, as shown in the NTEA Framework presented in Table 8.5, the ward element Storage Room in Ward A and Day Room in Ward C, have scored below the 55% PCI score mark. The Storage Room in Ward A has been rated to be a ward element of high relevance with respect to 'moving and handling' tasks. Likewise, the Day Room in Ward C was rated to be of high relevance in case of four nursing tasks, namely, 'moving and handling', 'watching', 'psychological support', and 'answer patient buzzer'. Therefore, the low PCI scores of these two ward elements make them critical not just in themselves, but also from the perspective of the nursing tasks for which they are most relevant, and, for which they are expected to offer the highest level of support. This understanding could enable management attention to focus on specific areas of the nursing practice environment in order to take necessary measures to restore a fit between nurses' capacity and the particular ward element. Resources can thereby be better allocated rather than engaging in an en bloc refurbishment of a whole facility.

The next question is to decide on the most suitable person to implement the NTEA Framework and how this implementation should be conducted in practice. Against understanding highlighted above, the most suitable to implement the NTEA Framework is the facilities manager. Of the five groups of stakeholders highlighted in section 8.4.3, the FM manager would equipped with the most relevant knowledge to understand and implement the NTEA Framework. As suggested in section 8.4.4, the four stages of a building lifecycle when the NTEA Framework could be instrumental are design, use, manage and review; the FM manager is the only stakeholder that would most likely be involved in all of these four stages. The NTDM would be given as a prepared format of the NTEA Framework. The task of the implementer is to administer the WEAT for the specific ward environment and then evaluate the results. This can be conducted in five simple steps. With an appropriate knowledge of the NTEA Framework, the following steps should be followed in its implementation:

a) A preliminary walkthrough of the ward designated for assessment is undertaken, so the implementer would be familiarised with all spaces and ensure that all ward elements have been incorporated in the WEAT checklist.
b) For ward elements that occur more than once, a decision should then be made which ward element will be selected for the WEAT post-occupancy evaluation.
c) The POE is conducted.
d) The PCI score for each of the ward element is calculated.
e) The PCI score for the each ward element is entered into the prepared NTEA Framework (Table 8.5).
f) The critical areas are identified, based on the level of relevance of the ward elements to the nursing tasks.

8.6 Summary of Chapter 8

This chapter has addressed Objective 6 of this research project, which was to develop and validate a framework that could support the creation of a fit between ward nurses' capacity and their work environment. First, a rationale for the development of the NTEA Framework was given. Then it was demonstrated how the conceptual framework of the research project, introduced in Chapter 1 and developed to its full scale through the theoretical underpinning of this study, i.e. the P-E fit, supported the construction of the NTEA Framework. The contribution made by the exploratory or pilot studies to the fine-tuning of the conceptual framework were also highlighted. This was followed by a thorough presentation of how both the empirical field investigations and the desk-based analytical work helped in constructing the Nursing Tasks and Environmental Assessment Framework. The chapter concluded by showing how the stakeholders may implement the NTEA Framework and at what stages of the building lifecycle.

CHAPTER 9: DISCUSSIONS AND CONCLUSIONS

9.1 Introduction

This is the concluding chapter of the thesis and it summarises some of the major aspects of the research project. First, the key findings are discussed based on the theoretical-conceptual underpinnings and the practical outcomes of the research study in the context of the research question postulated in Chapter 1. The discussion was then broadened to population ageing and the inevitable need to maintain independence in older people through active ageing. It is argued that the practical outcomes of the study stand to inform current discourse of the need for people to work longer as a crucial way to maintain independence in older age. This is followed by highlighting some major limitations to the research findings, identifying the practical implications for the study and the potential future research areas that could be informed by the findings. The thesis concludes by highlighting some of the contribution the study has made to knowledge followed by a personal reflection of the researcher on the research process.

9.2 Key Findings

This section draws upon the entire thesis to present the principal findings of this PhD study. This PhD research project derives its justification from UK ageing population and the impacts of this demographic change on the workforce. By focusing on the National Health Service, which is the largest employer in the UK, it was presumed that lessons learned from this study potentially have the greatest impact for policy, practice and further research. The key findings of this PhD study can be grouped into two broad categories. The first category entails the theoretical-conceptual underpinnings of the research topic. The second category can be termed the practical outcome of the study. These two categories will be discussed in the context of the research question postulated in Chapter 1, and how these relate to the wider literature. While the six research objectives, outlined in Chapter 1 have been set to achieve specific goals, the research question posed at the beginning of this thesis offered a broader hypothetical platform to accomplish these objectives. The research question this PhD sought to answer was to explore how architectural design features of NHS hospital wards could be used to create a fit between ward nurses and their work environment. To recap, the research question is:

> ***"How could the architectural design features of NHS hospital wards be used to create a fit between ward nurses and their work environment, by applying the P-E fit theory?"***

9.2.1 Theoretical-Conceptual Underpinnings

Underpinned by the P-E fit theory, the importance of the relationship between a person and their environment has been brought to the fore in this PhD project in the case of NHS ward nurses. A prominent strand of the P-E fit theory is the Work Adjustment model, in which an individual fulfils the requirements of the work environment and the work environment fulfils the needs of the individual, with the components of the person and the environment being independently measurable (Rounds et al., 1987). By exploring the interplay between the various components of personal and environmental factors in the work environment, it is suggested that age and general health conditions are intrinsic to the 'person' in P-E fit transactions. In contrast to diminished physical capabilities, age-related cognitive changes may be less observable even in an age-friendly work environment, as older workers may not just compensate for such diminution in cognitive capacity, through experience and space familiarity, but also be more predisposed to acquire new skills and knowledge in a familiar work environment (Oakman and Wells, 2016, Renkema, 2006). Indeed, age, subjective assessments of learning attitudes, skills or motivation have been found to play neutral roles in how stimulating workplaces were experienced as learning environments (Tikkanen et al., 2002). The inclination of older workers to continuing professional development dispels wrongly held stereotypes that older workers are less motivated toward lifelong learning (Jarvis, 2005), which affects their career prospects (Bowen and Staudinger, 2013). Arguably, the proposition of this PhD study to create a work environment that supports NHS ward nurses transcends the mere retention of older nurses, as older nurses may continue to nurture their existing skills and knowledge in an age-friendly and inclusive work environment. In its original form, the P-E fit has been used to address accessibility issues in the home environment, through environmental modifications that reduce environmental barriers (Lien et al., 2016), usually harnessed by an environmental assessment tool (Horowitz et al., 2013). However, this has historically been undertaken by assessing the person's and the environment's characteristics separately, as if the two were independent of each other, thereby an inherent conceptual misfit may form part of the assessment process (Wahl et al., 2009). In contrast, this study has perpetually explored the interplay between ward nurses and the ward environment, by advocating for an enabling environment designed relative to functional usage.

A core premise of this PhD study was the conceptual framework that guided the research, introduced in Chapter 2. It was established that for the objectives of this PhD research project to be accomplished, it was inevitable to understand the nuances and the interplay between the job demands, the functional capacity and the environmental demands of ward nurses. However, a more compelling question is how the conceptual framework has contributed to answering the research question. Firstly, both literary and empirical evidence suggest that job demands of ward nurses, which includes characteristics of the work environment, such as erratic shift patterns, time pressure, suboptimal staffing levels or excessive workloads, adversely impact on nurses' personal constructs (O'Shea, 1999). It has been reported that the physical design of the workspace may negatively affect cognitively demanding nursing tasks, such as the administration of medication (Chaudhury et al., 2009). This PhD study established that the conjugating effects of high intensity and prolonged job demands and ill-conceived architectural design features of hospital wards might induce older nurses to vacate the profession prematurely.

Secondly, functional capacity has been the most widely applied method for determining the fitness of a worker to perform job-related tasks, and return-to-work ability. However, as it was extensively elaborated in Chapter 5, this method has been argued to have many flaws, the most critical one being its predominant focus on the measurement of physical abilities of workers (Gibson and Strong, 2002). There are profession-specific methods for Nursing Functional Capacity Evaluation (Jang et al., 2007). One of the key propositions of this PhD study is the replacement of FCE with Nursing Functional Capacity Evaluation through the introduction of the NTDM, as will be discussed later in this chapter.

Thirdly, an important conceptual approach adopted in this PhD study was to link the services offered by the elements of the built environment with the functions for which these elements were designed. This study took a hypothetical stance that workspace design assessment should be viewed from the perspective of the function for which those spaces have been designed and thus explore the extent to which such functions have been fulfilled in practice, depending on the relevance of the ward element to the nursing tasks. For instance, some authors have argued that the design of the physical workspace can be used to evoke positive outcomes for employees and that "…functionally uncomfortable workspace draws energy out of the worker that would otherwise be directed to performing work" (Vischer, 2007, p. 180.).

Together, these three components of the conceptual framework have contributed to answering the research question postulated in this thesis. While there is scant research evidence on the relationship between job demands, functional capacity and environmental demands vis-à-vis architectural design features of hospital wards, the introduction of the P-E fit theory provided a resounding springboard to the conduct of this research study, from a theoretical-conceptual perspective.

Furthermore, it has long been established that good design of the built environment may be used to enable individuals with diminished capabilities, whereas ill-conceived design may render persons without any known disabilities less able to use the services offered by the built environment. The overarching theoretical premise of this PhD study was that persons with lower functional competence are generally more susceptible to the demands of the environment, compared to individuals with higher functional competence (Iwarsson, 1999). However, the universal design principles, which gained prominence in the 1960s and 1970s, have since evolved further. The conceptual foundations of universal design stem from the socio-political movements of the time, which signified that "…environmental conditions are the primary source of enabling or disabling of people with diverse disabilities…"(Erkiliç, 2011, p. 181.). Over the decades, the implementation of universal design principles has taken more holistic approach toward "disabilities", due to its stigmatising tendency, as designers' attempts to create inclusive environments frequently resulted in inadvertent exclusion or marginalisation of the very people it had set out to support (Ostroff, 2011). This paradigm shift transcends nation states, as the United Nations Convention on the Rights of Persons with Disabilities declares “equality of opportunity and accessibility” as inextricable from core human rights (United Nations, 2006). The new paradigm, it is argued, should depart from projecting disability as an individual’s failure. Emphasis should, instead, centre on the resolution of the misfit that emerges when personal limits collide with environmental needs (Masala and Petretto, 2008).

This PhD research study rests on this emerging paradigm, as a core conceptual consideration adopted was that the individuals to which the architectural design features would apply, are expected to be healthy ward nurses, without any known disabilities. While this conceptual premise is in stark contrast to what the universal design principles stood for, questions could be raised on its adequacy for this study. For instance, ward elements are not designed to be used exclusively by ward nurses; therefore, the seamless incorporation of patients’ needs and the expectations of other users of the services of these spaces pose substantial design challenges to designers and managers of these healthcare facilities. The application of universal design principles in the collation of the architectural design features used in the construction of WEAT was undertaken bearing in mind this paradigm shift. This goal was accomplished against the backdrop of the P-E fit theory. Therefore, from the perspective of the research question this PhD study proposed to answer, regarding the application of the P-E fit theory in hospital wards for ward nurses, it can be safely proclaimed that this objective has been achieved. In the face of an ageing NHS nursing workforce, attending to the needs of an ageing population, it has become imperative to transpose the P-E fit theory into the design of hospital wards, by applying some of the guidelines offered by the universal design principles discussed in section 2.7.1.

9.2.2 Practical Outcomes

Whereas the theoretical-conceptual underpinnings of this study were derived from an iterative review of existing literature, the practical outcome are the major outputs of this PhD project. These outputs are essentially the three components of the model created to facilitate a fit between ward nurses and NHS hospital wards; namely the Nursing Tasks Demand Matrix (NTDM); the Ward Environment Assessment Tool (WEAT); and the Nursing Tasks and Environmental Assessment Framework (NTEA Framework). This section highlights these three components, discussed in the context of the research question. The model constitutes of a matrix, a tool and a framework. These practical outcomes have resulted from the synthesis of the empirical data collected during the research process.

The first of the main practical outcomes of this PhD research project is the Nursing Tasks Demand Matrix (NTDM). The creation of the NTDM was not part of the original objectives of the study. What this study has sought to accomplish, according to objective 5, was to determine the functional capacity of hospital ward nurses within the NHS. However, an in-depth review of the literature established that mainstream tools used for functional capacity evaluation might not be fit for purpose in this study. Most Functional Capacity Evaluation (FCE) instruments measure the exertion of physical effort and therefore, may not be appropriate for use in settings, such as in nursing practice, in which complex tasks are performed and the demands of the job are multidimensional. The main point of departure of the NTDM, as proposed in this study, compared to other mainstream methods used for nursing functional capacity evaluation, is its holistic approach. FCEs are used to evaluate the ability of a worker to return to work. The NTDM, on the other hand, is a means to an end, and not the end in itself. The NTDM illuminates the nuances of the nursing tasks performance, and then relates these to the work environment, with the aid of the Ward Environment Assessment Tool. The results of the investigative interviews were used to identify the nursing tasks in a ward setting. Then Nursing FCE was contextualised as a function of patient-nurse interaction (PNI), and as such, exhibit demand attributes in domains such as patient care, patient surveillance and patient support. A major assumption in this approach to Nursing FCE is that the individual is a healthy person. Therefore, a supporting environment would facilitate the performance of the identified nursing tasks, while an ill-designed environment may impede nurses in their job role. The Nursing Tasks Demand Matrix consists of unilateral tasks and multilateral tasks, with each nursing task plotted against appropriate PNI domains. The matrix may be used to assess the degree of the demands of nursing tasks; hence necessary environmental adjustments may be made.

The second practical outcome of this study is the creation of the Ward Environmental Assessment Tool. After the construction of the NTDM, it became apparent that a comprehensive Nursing FCE may only be fully undertaken in the context of the nursing practice environment. Therefore, understanding the parameters of the architectural design features of the nursing practice environment was essential to ascertain the functional fit between the ward nurse and the ward environment. This understanding should thus be based on an objective evaluation of hospital wards, by analysing in detail their major spatial components, where these nursing tasks are performed. The spatial components are termed ward elements that can be found in a typical hospital ward and with which nurses inevitably interact in the course of their duties. Fourteen ward elements were identified. A review of the literature established that there is currently no adequate ward environment assessment instrument readily available for the assessment of hospital wards. It was therefore decided that an assessment tool should be constructed anew. To achieve this objective, a critical review of existing environmental assessment instruments, used in similar settings, was conducted. These tools are used to assess special care units of healthcare facilities, residential care homes, or adapted living environments for people with physical, cognitive, or sensory impairments. Five instruments were explored in greater detail, including the following:

i. Multiphasic Environment Assessment Procedure (MEAP)
ii. Professional Environment Assessment Procedure (PEAP)
iii. Therapeutic Environmental Screening Survey for Nursing Homes (TESS-NH)
iv. Sheffield Care Environment Assessment Matrix (SCEAM)
v. Evaluation of Older People’s Living Environments (EVOLVE)

As established in Chapter 4, the three most important personal constructs of nurses affected by the built environment are the physical, cognitive and sensory constructs. These five tools were used to establish literary evidence of these; and a fourth construct termed universal, was introduced, at this stage to account for other aspects of nurses' constructs not covered in the three predetermined ones. Finally, an extensive review of the literature (Moos and Lemke, 1980; Lawton et al., 2000; Sloane et al., 2002; Parker et al., 2004; Lewis et al., 2010) was undertaken. A number of design standards, such as the 'Health Building Notes' by the UK Department of Health (2014); the 'Inclusive Design Toolkit' by University of Cambridge (2015); and the 'Accessibility for the Disabled: A Design Manual for a Barrier Free Environment' manual by the United Nations (2003), were consulted. These resulted in the collation of more than 700 architectural design features which could be assessed by administering WEAT. The tool was then validated with one of the stakeholders, who was also a facilities manager, to ensure its components were adequate. Three of the four case study hospital wards were selected for further exploration through post-occupancy evaluation with the aid of the newly constructed WEAT. Based on the methodological approach of post-occupancy evaluation, as a diagnostic tool, WEAT was used to unpick important architectural design features that have the most severe impact on the four personal constructs of nurses. In the administration of WEAT, the hospital wards were assessed with respect to their impact on the physical, cognitive, sensory and universal constructs of nurses coming in contact with the ward elements. A comprehensive evaluation of the ward elements by exploring their impacts on the personal constructs of nurses resulted in a personal construct impact (PCI) score, computed in percentage points, for each of the 14 ward elements. The higher the PCI score of a ward element the more adequate are its architectural design features to support ward nurses, with respect to the relevance of the ward element to the nursing tasks it was designed to support.

The third component of the model is the NTEA Framework. The NTEA Framework is a two dimensional approach to creating a fit between ward nurses and the ward environment. The first dimension constitutes the nursing tasks, which is operationalised by the Nursing Tasks Demand Matrix (NTDM). The NTDM conceptualises nursing functional capacity evaluation as dependent on the adequacy of the built environment to support nurses while undertaking these tasks. Essentially, this approach is based on the person-environment fit theory, which suggest that the built environment is either an enabler or disabler, depending how it has been designed. The second dimension is the environmental dimension, which is operationalised by the Ward Environment Assessment Tool (WEAT). The NTEA Framework creates a common platform for all stakeholders interested and involved in the designing and management of nursing practice environment. It is the first comprehensive attempt made to ensure that the design and management of the ward environment take a nuanced approach. A careful application of the architectural design features of the ward elements could be used to create a fit between ward nurses and the nursing practice environment, underpinned by the P-E fit theory. In the application of NTEA Framework, caution must be applied not to use the model, to coerce older nurses into ill-designed jobs, or work environments unsuitable for their personal circumstances.

While the theoretical-conceptual underpinnings of this PhD study created a firm foundation, based on which the research question was formulated, the attainment of creating a fit between ward nurses and their work environment would have been a futile effort, if not harnessed by a tangible instrument. Anchored by the P-E fit theory, the NTEA Framework helped to answer the research question, by providing a practical framework for stakeholders, which is a multidisciplinary platform to deliberate on an appropriate intervention in the design of NHS hospital ward, should these fail to fulfil the expectations of their users.

9.3 Discussion of Key Findings

Over the last couple of decade, policy interventions and research conducts have pursued the novel goal of improving people's wellbeing by promoting independent living. In addition, there is a growing interest among researchers in improving people's quality of life. This realignment of focus on quality of life, it is suggested, stems from the recognition that neither government policies nor medical interventions per se could elevate individuals' subjective levels of happiness and wellbeing (Walker and Hennessy, 2004). The most prominent question among researchers is the degree, if at all, by which quality of life could be influenced. While it can be argued that there is no clear definition for quality of life, it has been claimed to be shaped by both individualistic and societal perspectives (Felce and Perry, 1995). An acceptable definition is the one proposed by the World Health Organization Quality of Life group, which elevates the discourse of quality of life onto the international platform. The WHOQOL (1995, p. 1405.) maintains that quality of life is an "…individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns". Central to the WHO notion of quality of life is the ability of the individual to maintain some degree of independence.

In an ageing society, the benefits of working longer for individuals cannot be underestimated. Even more so, the cumulative societal gain is greater than the sum of its parts. This research project took the more holistic approach of creating an equitable environment in which the choices made by individuals could translate into greater benefits for themselves, their families and the society at large. That choice means an individual could make the decision to work for as long as they wish or their abilities would allow them. As more people are living longer and their disposition to morbidity increases, the line between disability and reduced capabilities due to age becomes less obvious. Therefore, the welfare state, within the social safety system, has to protect people who are less able to care for themselves, one way or the other. However, within this social system, converting welfare recipients to earning workers has always been at the centre of most social policies, across the political spectrum in the UK (Gotoh, 2001).

Beyond the social contexts of ageing, and the support afforded by the social protection systems, the importance of maintaining independence in older people is not newfound in the research literature. The implications of old age on disability, frailty and comorbidity has been extensively researched (Fried et al., 2004). There are clinical assessment methods used to determine an older person's ability to perform self-care functioning, such as activities of daily living (Iwarsson, 2005, Czaja et al., 1993) or executive functioning, such as instrumental activities of daily living (Oppewal et al., 2015, Roy et al., 2016). However, when the focus of 'measure' is on a presumptive actively engaged, able-bodied older worker, researchers are presented with the conundrum of distinguishing between the pre-existence of disability and the ability to perform daily duties.

According to the Equality Act (www.legislation.gov.uk, 2011), a person has a disability if the person has physical or mental impairment, and the impairment has a substantial and long-term adverse effect on their ability to carry out normal day-to-day activities. The Equality Act also stipulates certain protected characteristics, including age and disability, and advocates for a society free of discrimination against individuals exhibiting any of these protected characteristics. However, legislative promulgations were preceded by philosophical approaches to the attainment of equality in modern societies, notably in the capability theory, in which Sen (1992) argues that the assessment of equality has to be juxtaposed with the existence of pervasive human diversity. Nussbaum and Sen (1993) claim that the capability of a person corresponds to the freedom they have in making the choice to lead one kind of life or another. Capabilities approach, it is argued, should derive from the basic premise of human rights (Nussbaum, 2003). Nussbaum and Sen (1993), however, warn against the illusionary notion of 'freedom' in making a choice to lead a particular type of live, especially if the 'price' to make that choice is 'unaffordable' for the individual. For instance, societal 'expectations' demanding that people should be offered the free will to exit the workforce at a particular age may subject older workers to latent psychological pressure. If, therefore, adequate workplace adjustments are not implemented to accommodate age-related diminution in workability, "equality" at work may actually be experienced as a form of discrimination by older workers. Therefore, in the capability theory, the notion of freedom to choose and the availability of plausible alternatives cannot be separated, or evaluated independent of each other. For example, in a later essay, Nussbaum (2009), argue that societies must provide for people with cognitive disabilities, even if such provisions can only be made at extra costs, as no modern society can make claim to equality if 'normalness' is discriminatory.

In this PhD study, the argument is not the compulsion of nurses to work for an indefinite period of time, but to be given the choice to be able to do so and, more importantly, in a flexible manner. The Ward Environment Assessment Tool is an instrument that can help determine if the physical environment is offering older nurses the freedom to make the choice between working longer, reducing working hours, or retirement, based on their individual personal circumstances. With the NTEA Framework fully implemented, it can be determined if the ward environment is sufficiently supportive of ward nurses, and if not, necessary adjustments could be made. By creating an age-friendly environment, as suggested in Chapter 4 (to consider important issues for employees, such as health, flexibility and retirement), older ward nurses may be able to make informed decision regarding their work life.

An increasing number of people in their 60s and 70s, who themselves are already being challenged by health conditions due to advances in age, would have to cater for even older relatives as life expectancy continues to increase. This, inevitably, imposes some demands on the healthcare system, as the health condition of the oldest old age cohort may deteriorate with increasing life expectancy. It is noteworthy that of the three characteristics of an age-friendly workplace (namely health, retirement and flexibility), health was an important predictor of an older worker's intent to leave their job. However, one of the most compelling findings of this study is that most ward nurses would move to more sedentary roles within the NHS, as they advanced in age, due to the job and environmental demands of the ward work area within the NHS. In the absence of sedentary alternatives, older nurses would exit the profession altogether. This is a crucial problem, of which NHS human resource management should be aware. A responsive policy intervention is required to avert a tendency for nurses to leave the NHS prematurely, and the implementation of the NTEA Framework could provide a useful support of such a strategy.

A major part of the findings of this study is the presumption of the conventional mode of nursing practice, with respect to moving patients to procedures or taking equipment to patient's bedside to perform medical interventions. In the event that the NHS proceed to roll out a scheme whereby a growing number of medical procedures will be brought to the patient bedside, this will have profound ramifications for ward space design and usage. For example, the current space requirement near bedside may need to be reviewed should the wide scale use of the mobile nurse station prevail, in which case the adherence to the concepts of a fixed 'central' nurse station, patient visibility and nurses' mobility would all have to be reconsidered. Consequently, the implementer of NTEA Framework would have to take this evolving trend into consideration.

9.4 Conclusion

It is apparent that the ageing population in the UK will be one of the most challenging societal issues in the coming decades. Even with governmental interventions, such as the removal of the default retirement age, most employers are underprepared for the consequence of an ageing workforce. As the baby boom cohort exit the labour market, most employers will struggle to replace their expertise with new entrants and younger colleagues. This study has approached one of the most challenging social issues from a multidisciplinary perspective. The social dimensions of ageing, including the consequences for the healthcare system in general and the exploration of the nursing profession in particular; the environmental gerontology dimension, which explored the applicability of person – environment fit theory for older nurses; the discreet use of universal design principles, with respect to accessibility in the built environment; have converged to deliver a model, the NTEA Framework, that addresses a contemporary problem, which may evolve to be one of increasing prominence.

9.5 Limitations of Research

One of the most significant limitations to the findings of this research is what Johnson (1997) termed the "researcher bias". It must be appreciated that researcher bias is an inherent part of studies applying qualitative approach. However, its impact and ubiquity could be reduced and confined to acceptable dimensions, with an appropriate research design. The researcher bias needs to be identified and admitted as existing by the researcher. While a qualitative research might not be entirely value-free, the acknowledgment of researcher worldview offers some credence to the research findings regarding the potential influence such worldviews might have had in the research process. For instance, it was consistently reiterated throughout this thesis that this PhD research is situated within the built environment, an area where the researcher had 'hands-on' experience and in which the supervisory team had valuable expertise. Undoubtedly, the academic background and experiences of the researcher must have influenced certain crossroads decisions made during the research process. The researcher bias, however, need not distort the research process and the interpretation of the research results. By embedding 'checkpoints', such as reliability and validity 'technical fixes' discussed in Chapter 3 throughout the research process, it can be safely claimed that researcher bias in this project had been minimised. Another mitigating factor to researcher bias is the employment of quantitative methods in the data collection process. WEAT was used to collect quantitative data, which were then descriptively analysed, provided further credence to this study and reduced the potential researcher bias.

The second limitation to this study is that of 'numbers'. As a case study research, the minimal number of 'cases' studied, with respect to both the number of participants interrogated and the number of sites surveyed for the post-occupancy evaluation may cast some doubts over the generalisability of the research findings. However, the attainment of generalisability was not the objective of the study. Nevertheless, it must be appreciated that apart from the pilot interviews conducted to fine-tune the interview and the focus group questions, a total of 38 participants have been recruited and interrogated across the five phases of the research process. As suggested by Sandelowski (2001), numbers can be used to demonstrate what is already known about the research topic and also to describe the sampling strategy. However, the counting pitfall must be avoided as an omnipotent embodiment of reliability and validity in research studies. Admittedly, the number of participants interrogated in this study is not sufficient in itself to confer rigour to the research. By corroborating qualitative data with quantitative data, and by employing a validation regime that involved the original respondents in the study, it was ensured that the quality and the quantity of research data minimised the potential adverse effect of small numbers. Besides, the use of respondent validation to confirm the findings of the study as a true reflection of participants' own account offered further rigour to the study.

In addition to the above, there are certain limitations in this study that can be attributed to the use of WEAT. One of the shortcomings with WEAT is that it was validated by only one person, that is, the facilities manager at the NHS LTHTR, where data was collected. This raises the question of objectivity. Critics of the study may contest that, as an 'insider', the FM manager is not a position to give an objective opinion of the tool. Furthermore, as a newly developed tool, WEAT has only been tested on three hospital wards. Questions could be raised about the extent to which WEAT was able to capture all the architectural design issues nurses might face on a ward. For example, as discussed in section 7.7, in the administration of WEAT, some 'outliers' were observed in the architectural design features, which resulted in some ward elements scoring 100% or 0% PCI. This has been the result of too few architectural design features being used; hence, compliance or non-compliance with these limited number of design items could easily result in extreme PCI scores: 'very high' or 'very low'. This thus raises the question whether all the architectural design features relevant to a ward have been fully captured in the compilation of these design items.

A further limitation is the geographical restriction. It can be argued that the data collection had focused on a particular region of the country, which may not be representative nationwide. In the first instance it is important to note that any research, including this PhD study, would lose focus if it cannot be demonstrated how it impacts on its immediate or wider community. The University of Central Lancashire has funded this PhD study, therefore it made logical sense to engage the local community in the data collection process, in this case NHS Lancashire Teaching Hospital Trust in Northwest England. Furthermore, while protocols may vary from country to country, the nursing practice and procedures are quite standardised within the NHS (Cowan et al., 2005). Therefore an in-depth exploration of a particular case in a certain geographical location does not confine the knowledge locally constructed to the studied case alone. Besides, implementing the NTEA Framework requires a holistic approach. For instance, while the NTEA Framework offers a broad basis for understanding the Nursing Functional Capacity Evaluation, it considers the local conditions with respect to the ward environment, which would be objectively assessed with the aid of the Ward Environment Assessment Tool.

Another limitation may be the resolution of potential conflict between patient interest and nursing staff interest. This study has focussed on the needs of ward nurses, whereas very little attention have been channelled to patient needs. The architectural design features have been selected for ward elements from the perspective of ward nurses, some of which might be in conflicts with the needs and expectations of patients. Granted that hospital wards are essentially designed to support patient healing process, the implementation of NTEA Framework could potentially pose a conflict of interest between patient needs and the expectations of the nursing staff. While great care had been exercised to remove any potential conflict of interests in the collation of the architectural design features, it is noteworthy that this risk could not be completely eliminated. Therefore, it is vital that implementers of the NTEA Framework be aware that focussed attention to satisfy nursing staff is not achieved at the detriment of patients. The benefits ward nurses stand to derive from NTEA Framework would be lost if these were not aligned to the interest of patients.

Lastly, questions could be raised about the tenability of the research findings over time, as a new policy, regulation, technology or even evidence-based research could open newer perspectives toward the notion of creating a fit between nurses and their work environment. While there are no guarantees to the contrary, one would expect that measures to improve the working conditions of nurses within the NHS would be evolutionary, taking account of existing knowledge of the nursing practice. However, as the largest organisation and employer in the UK, policies around the NHS are expected, to a great a less extent, to be politicised.

9.6 Recommendations for Practice

The Nursing Tasks and Environmental Demand Framework offers a multidisciplinary platform to professionals of different backgrounds to assess nursing practice, based on the same frame of reference. The NTEA Framework provides a nuanced understanding of nursing tasks on hospital wards, and could aid the use of architectural design features of hospital wards to enhance nursing work environment. The NTEA Framework may be used by ward managers and ward nurses, occupational health advisors, human resource managers, facilities managers, and other stakeholders interested in nursing tasks and work environment. Each of the components of the NTEA Framework could be used individually on a stand-alone basis, or collectively. For example, the Nursing Tasks Demand Matrix may aid ward manages to determine task assignment among nursing staff, because it illuminates nursing tasks and may establish which tasks could be posing greater demands for nurses, taking into consideration the characteristics of the local setting. From the perspectives of tasks performance and the suitability of environmental factors, the occupational health advisors and the facilities managers are the two main professionals that could benefit from the application of the NTEA Framework, both of which are highlighted below.

Occupational health advisors perform pre-employment health screening in order to establish an employee's fitness for work. To achieve this, occupation health advisors use Functional Capacity Evalutaion in their assessment. However, as discussed in Chapter 5, most of the available assessment methods rely on the measurement of an employee's physical ability. For example, the ability to lift, stretch, reach, bend and in some cases, the ability to stand or sit for an extended period of time. However, this mode of FCE assessment is fraught with errors, as nursing tasks and the demands therefrom may not necessarily be physical in nature. Job demands may impact on ward nurses' cognitive, sensory or universal constructs, with negative health outcomes, even if these may not be readily discernible. In addition, ward nurses who have suffered job related injuries may have to 'prove' their ability to return to work. Again, occupational health advisors are the ones responsible for conducting these 'return-to-work' assessments, which usually takes the form of establishing if the employee is capable of performing certain physical tasks, and if any adjustments to the work environment are necessary. The NTDM could be used to illuminate the various domains of the PNI and determine, for example, if a ward nurse could be exempted from certain tasks, as the demands of such tasks could be easily determined, in comparison with other tasks. The NTDM may be used to justify such an exemption.

In addition facilities managers may use WEAT to conduct an independent POE of hospital wards to form part of management information system when trying to establish a case for the refurbishment of their healthcare facilities. Facilities managers have been criticised in failing to play a strategic role in the management of buildings in order to preserve and/or increase owners' values. Thus it might be necessary to make periodic maintenance or carry out necessary refurbishment projects on NHS healthcare estates. While these would usually be conducted as large-scale overhaul projects, it might be necessary to make selective adjustments based on the changing needs of the users of NHS estates. With falling financial resources, the NTEA Framework could be used to argue and build a business case for the selective refurbishment of segments of NHS estates, in this case, hospital wards, and achieve a higher level of user satisfaction, without the need for large capital expenditure.

9.7 Recommendations for Future Research

One of the potent basis for further research is the taxonomy of nursing tasks as multilateral and unilateral as presented in the NTDM, which may be explored from both the physical and psychosocial perspectives. There was a limited scope to explore the potential impacts of the NTDM in this project, with respect to the relationship between the multilateral tasks and unilateral tasks, as some of the tasks might be relevant in some settings than others. It might also be necessary to add further tasks so as to reflect the local environment where the NTDM is being implemented.

The findings of this research could be used in other professions within the NHS, apart from nursing. The implementation of the Nursing Tasks and Environmental Assessment Framework has the potential to 'spill over' to other professions such as doctors, porters or paramedics, who, though less in numbers compared to nurses, may be facing demanding work conditions on a daily basis. Beyond the NHS, there is scope for the NTEA Framework to be used in other jobs and professions, such as in factories, where the impacts the built environment have on employees may be of such significance that an objective measure of the adequacy of the building elements may be required. In addition, the newly developed WEAT, which had been developed in this study, as a means of assessing hospital wards, has only been 'tested' on three wards. It is worth exploring how a wider, larger scale implementation could be achieved. A possible area of further research could be to test WEAT on a large number of hospital wards, in order to establish its statistical generalisability. Furthermore, there is scope to adapt the parameters of WEAT and test them in non-healthcare buildings in order to advance post-occupancy evaluation in these newer settings.

9.8 Originality and Contribution to Knowledge

The original goal of this study was to develop the Nursing Tasks and Environmental Assessment Framework; however, it became apparent that the built environment, as an enabler or disabler of its user, needed to be objectively assessed in order to establish the fit between ward nurses and their work environment. This led to the inadvertent development of a new tool, the Ward Environment Assessment Tool (WEAT). While this was not part of the original research design, an in-depth review of the literature did not identify a suitable instrument that could be used to assess hospital wards. It therefore became imperative to develop WEAT in order to achieve the main goal of the research. Due to its versatility, WEAT can be used on a stand-alone basis, without the need to implement the full scale NTEA Framework. This is a new development that has contributed to the existing body of knowledge in the field of post-occupancy evaluation of hospital wards. This has been achieved in addition to the ultimate goal of the study, to develop the NTEA Framework. Another critical learning point in this regard is that this study had been designed to be a qualitative research project, in which qualitative data would be collected and qualitatively analysed. However, the development of WEAT added an unanticipated layer of validation to the study. The triangulation of the quantitative results obtained from the WEAT POE with the qualitative data collected at other stages of the research made the study a 'quasi' mixed methods research. This study is novel in that the P-E fit had not been previously investigated in the contexts presented. It was demonstrated how new knowledge could be created through the application of an existing theory, in a new setting.

One of the foci of this study was to make a unique contribution to the field of environmental gerontology by advancing existing knowledge regarding person environmental interactions. After the pioneering work of M. Powell Lawton in the 1960s and 1970s (Lawton and Simon, 1968; Lawton, 1970), a number of empirical applications have been made for which these earlier studies offered the evidence base (Iwarsson, 1999, Davidson et al., 2000). However, at the turn of the millennium, critical debates are beginning to emerge (Wahl and Weisman, 2003) in the environmental gerontology research community on the slow progress made in how to further use this evidence-based research to improve the quality of life of older people. While it is recognised that modern medical technology has delivered solutions to previously fatal health conditions, thereby reducing morbidity and improving people's life prospects, especially in older people, environmental gerontology research has been slow to embrace these medical advancements. It is paramount that environmental gerontology provides the subtle understanding of the circumstances of older people in order to offer holistic approach to addressing population ageing.

On the other hand, the recognition among policy makers and researchers that population ageing means people will have to work longer falls largely short of this expectation. Legislative requirements alone will not be sufficient to ensure that people are able to work longer. No matter how compelling the evidence is, this study proposes longer working life should be a case of an individual's choice, which should be supported by employers, in part, through the provisions offered by the physical environment. This is important because older people are a diverse group that experience the ageing process differently. The ability of an older worker to make informed choice improves the individual's perceived quality of life. Making a work environment an age-friendly workplace through design has more benefits than just making physical provisions or adjustments to the work environment. This is an area that has not been previously explored in the environmental gerontology literature. Most studies that have looked at the quality of life of older people have focused on the passive stage of the life course, when older people have retreated to a 'passive' lifestyle with limited environmental stimuli (Victor and Scharf, 2005). This study, on the hand, focused on an active period of the life course of older workers, albeit one that has received very little research attention in recent past.

9.9 Personal Reflections on the Research Process

One of the most important learning points in this research process for me was my ability to design the research project, with stated objectives, while at the same time understanding that certain unplanned and unforeseen activities had to be performed for the ultimate goal of the project to be accomplished. It was important to approach the research process reflexively, bearing in mind the ultimate goal, while tentatively exploring newer perspectives. On the other hand, by establishing certain parameters at the beginning of the project, the research process was anchored on a predefined course. The identification of the NHS, and within that, the nursing profession as a research area, and by applying an existing theory, i.e. the P-E fit theory, helped to ensure the research stayed on the predetermined track; only inevitable deviations and justifiable modifications were made.

In addition, recruitment of participants and gaining access to data proved to be a challenging exercise. In the first instance, the research was conducted with the NHS, which is a setting where vulnerable people (e.g. patients) are located. Extreme care was required to ensure patient privacy was note infringed at any point during the data collection process. Furthermore, participants in the study were all busy individuals working in very sensitive and fast-paced environment, while some of them were in managerial positions. Gaining their attention to offer their time to participate in this study had been a tremendous achievement for me. Obviously, without the contribution of the participants, this research would not have been possible.

Moreover, obtaining the informed consent of the participants was also a critical aspect of the study. If at any point any of the participants had withdrawn from the study for whatever reason, the data collection process might have collapsed, which would have affected the overall morale of the other participants and could have affected my ability to recruit further participants in this study. Instead, I was able to engage the participants, some of them at multiple times (including through telephone and email). It is also notable that some of them were in managerial positions. I also make the claim that obtaining informed consent of participants went beyond a tick-the-box exercise for me. Participants were made to understand that their participation was voluntary and withdrawal from the study could be requested at any time without giving any reason. I would also make the claim that my ability to convince participants of the significance of the study and that they were making a contribution to the knowledge base of the research topic was crucial. Motivation must be aroused and sustained and vigilance had to be exercised by me to ensure that the relationship developed with the participants did not compromise the quality of the data collected. Access to quality data and the application of a robust research methodology are key to undertaking qualitative research study.

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APPENDICES

Appendix Number	Name
1.0	Identifying Challenging Job and Environmental Demands of Older Nurses within the NHS
3.1	UCLAN First Ethical Approval
3.2	UCLAN Second Ethical Approval
3.3	Certificate of Completion of the GCP training
3.4	NHS Research Passport
3.5	NHS Internal Approval
3.6	NHS Letter of Access
4.1	Exploratory Interview Question Schedule for Occupational Health Advisor
4.2	Exploratory Interview Participants' Profile
5.1	Interview record sheet
5.2	Completed nursing tasks data collection sheet
5.3	Letter of Invitation
5.4	Participant Information Sheet
5.5	Consent form
5.6	Participant Details Form
5.7	Sample of NVIVO transcript
5.8	Investigate Interview Participants' Profile
6.1	MEAP domains
6.2	PEAP domains:
6.3	TESS-NH domains
6.4	SCEAM domains
6.5	EVOLVE domains:
7.1	Table of Standard Maintained Illuminance
7.2	Ward A Layout
7.3	Ward B Layout
7.4	Ward C Layout
WA-WE01	Ward A Nurse Station
WA-WE02	Ward A Patient Bay
WA-WE03	Ward A Side Room
WA-WE04	Ward A Staff Room
WA-WE05	Ward A Ward Manager's Office
WA-WE06	Ward A Doctor's Office
WA-WE07	Ward A Day Room
WA-WE08	Ward A Corridor
WA-WE09	Ward A Storage Room
WA-WE10	Ward A Clean Utility
WA-WE11	Ward A Sluice
WA-WE12	Ward A Bathroom & WC
WA-WE13	Ward A Kitchen
WA-WE14	Ward A Entrance & Exit
WB-WE01	Ward B Nurse Station
WB-WE02	Ward B Patient Bay
WB-WE03	Ward B Side Room
WB-WE04	Ward B Staff Room
WB-WE05	Ward B Ward Manager's Office
WB-WE06	Ward B Doctor's Office
WB-WE07	Ward B Day Room
WB-WE08	Ward B Corridor
WB-WE09	Ward B Storage Room
WB-WE10	Ward B Clean Utility
WB-WE11	Ward B Sluice
WB-WE12	Ward B Bathroom & WC

WB-WE13	Ward B Kitchen
WB-WE14	Ward B Entrance & Exit
WC-WE01	Ward C Nurse Station
WC-WE02	Ward C Patient Bay
WC-WE03	Ward C Side Room
WC-WE04	Ward C Staff Room
WC-WE05	Ward C Ward Manager's Office
WC-WE06	Ward C Doctor's Office
WC-WE07	Ward C Day Room
WC-WE08	Ward C Corridor
WC-WE09	Ward C Storage Room
WC-WE10	Ward C Clean Utility
WC-WE11	Ward C Sluice
WC-WE12	Ward C Bathroom & WC
WC-WE13	Ward C Kitchen
WC-WE14	Ward C Entrance & Exit

Appendix 1.0

THE CENTER FOR HEALTH DESIGN

Health Environments Research
& Design Journal
2016, Vol. 9(3) 82-105
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Identifying Challenging Job and Environmental Demands of Older Nurses Within the National Health Service

Isaiah Oluremi Durosaiye, MA, MSc[1], Karim Hadjri, PhD[1], and Champika Lasanthi Liyanage, PhD[1]

Abstract

Objectives: To explore the existing theoretical contexts of the job and environmental demands of the nursing profession in the National Health Service (NHS) and to investigate how these job and environmental demands impact on the personal constructs of older nurses within the NHS. **Background:** Nursing is the single most widely practiced profession in the healthcare sector in the United Kingdom. However, nurses contend with challenging job and environmental demands on a daily basis, which deplete them of personal constructs (or resources) required to stay in the profession. **Methods:** A multilevel exploratory qualitative research design was employed. Ten managers were interviewed for the preliminary study, based on which the three characteristics of an age-friendly NHS workplace were established: health, retirement, and flexibility. Then an in-depth literature review revealed that the most adversely affected job within the NHS was the nursing profession. Finally, a focus group study was undertaken with six older nurses working in the NHS. **Results:** The most compelling finding of this study is that older nurses would generally not want to stay on the job if they had to work in the ward area. The physical, cognitive, and sensory constructs of older nurses are negatively affected by the job and environmental demands of the ward areas. **Conclusions:** Understanding how these job and environmental demands of the workplace affect an older nurse's personal constructs may help support a better design of nurse work and the wards and help extend the working lives of older nurses in the NHS.

Keywords

NHS, older nurses, job demands, environmental demands, health and well-being

According to the Health and Social Care Information Centre (2015), nurses make up more than 28% of the 1.3 million workforce of the National Health Services (NHS) in the United Kingdom (UK). It is the single most widely practiced profession in the healthcare sector in the UK. Beyond this, nurses play a crucial role in the delivery of high-quality healthcare services.

[1] University of Central Lancashire, Preston, UK

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Isaiah Oluremi Durosaiye, BSc, MA, MSc, University of Central Lancashire, Corporation Street, Preston PR1 1PH, UK.
Email: iodurosaiye@uclan.ac.uk

Appendix 3.1

UCLAN First Ethical Approval

10th January 2014

Karim Hadjri and Isaiah Durosaiye
Grenfell-Baines School of Architecture Construction & Environment
University of Central Lancashire

Dear Karim & Isaiah

Re: BuSH Ethics Committee Application
Unique Reference Number: **BuSH 218**

The BuSH ethics committee has granted approval of your proposal application 'An interdisciplinary approach to support age-friendly and inclusive workplace design within the NHS'.

Please note that approval is granted up to the end of project date or for 5 years, whichever is the longer. This is on the assumption that the project does not significantly change, in which case, you should check whether further ethical clearance is required

We shall e-mail you a copy of the end-of-project report form to complete within a month of the anticipated date of project completion you specified on your application form. This should be completed, within 3 months, to complete the ethics governance procedures or, alternatively, an amended end-of-project date forwarded to roffice@uclan.ac.uk quoting your unique reference number.

Yours sincerely

Gill Thomson
Vice Chair
BuSH Ethics Committee

NB - Ethical approval is contingent on any health and safety checklists having been completed, and necessary approvals as a result of gained.

Appendix 3.2

UCLAN Second Ethical Approval

8th October 2014

Karim Hadjri and Isaiah Durosaiye
Grenfell Baines School of Architecture Construction & Environment University of Central Lancashire

Dear Karim & Isaiah

Re: BAHSS Ethics Committee Application Unique Reference Number: BAHSS 207

The BAHSS ethics committee has granted approval of your proposal application 'An interdisciplinary Framework to Support an Age-friendly Workplace in the NHS'. Approval is granted up to the end of project date* or for 5 years from the date of this letter, whichever is the longer.

It is your responsibility to ensure that

- the project is carried out in line with the information provided in the forms you have submitted
- you regularly re-consider the ethical issues that may be raised in generating and analysing your data
- any proposed amendments/changes to the project are raised with, and approved, by Committee
- you notify roffice@uclan.ac.uk if the end date changes or the project does not start
- serious adverse events that occur from the project are reported to Committee
- a closure report is submitted to complete the ethics governance procedures (Existing paperwork can be used for this purposes e.g. funder's end of grant report; abstract for student award or NRES final report. If none of these are available use e-Ethics Closure Report Proforma).

Yours sincerely

Peter Herissone-Kelly

Peter Herissone-Kelly Chair
BAHSS Ethics Committee

* for research degree students this will be the final lapse date

NB - Ethical approval is contingent on any health and safety checklists having been completed, and necessary approvals as a result of gained.

Appendix 3.3

National Institute for
Health Research

Clinical Research Network

National Institute for
Health Research
Clinical Research Network

Appendix 3.4

Research Passport Application Form – Version 3 01/09/2012

Please refer to the guidance notes before completing the form.

Section 1 - Details of Researcher *To be completed by Researcher*

1.	Surname: Durosaiye		Prof☐ Dr☐ Mr☒ Mrs☐
	Forename(s): Isaiah Oluremi		Miss ☐ Ms☐ Other☐
	Home Address: 187 Kent Street, Preston PR1 1PH		
	Work Tel: 01772 896491 Mobile: 07909312364 Email: iodurosaiye@uclan.ac.uk		
2.	Date of birth: 13/05/1968	Gender: Male ☒ Female ☐	
	Ethnicity: Black-African	National Insurance number: SN524053B	
3.	Professional registration details, if applicable (Doctors undertaking any form of medical practice should confirm they have a licence to practise). N/A ☒		
4.	Employer:	or place of study: University of Central Lancashire, Preston	
	Work Address/Place of Study: Corporation Street, Preston, PR1 2HE		
	Post or status held: PhD Research Candidate		

Section 2 - Details of Research *To be completed by Researcher*

5\. What type of Research Passport do you need? Project-specific ☒ Multi-project ☐

If you will be conducting one project only please complete the details below. If you anticipate that you will be undertaking more than one project at any one time, please give details in the Appendix.

Project Title: An Interdisciplinary Approach To Support Age-friendly and Inclusive Workplace Design within the NHS

Project Start Date: 1 April 2013 **End Date:** 30 March 2016

Proposed start and end-date of 3-year Research Passport:

Start Date: 1 February 2014 End Date: 31 January 2017

NHS organisation(s):	Dept(s):	Proposed research activities:	Manager in NHS organisation:
Lancashire Teaching Hospitals Trust		Interviewing	
Lancashire Teaching Hospitals Trust		Focus Group Discussion	

Section 3 – Declaration by Researcher *To be completed by Researcher*

6.	Have you ever been refused an honorary research contract?	Yes ☐ No ☒
	Have you ever had an honorary research contract revoked?	Yes ☐ No ☒
	If yes to either question, please give details:	

I consent to the information provided as part of this Research Passport and attached documents being used, recorded and stored by authorised staff of the NHS organisations where I will be conducting research.

Signed: Date: 23/01/2014

When Sections 1-3 have been completed, the researcher should forward the form to the appropriate

The Research Passport: Version 3 Page 1 of 7

Appendix 3.5

NHS Internal Approval

Lancashire Teaching Hospitals NHS
NHS Foundation Trust

The Centre for Health Research and Innovation
Royal Preston Hospital
Sharoe Green Lane
Fulwood
PRESTON
PR2 9HT

Tel. 01772 52(8268)
Fax. 01772 52(3184)

CENTRE FOR HEALTH RESEARCH AND INNOVATION

Our Ref: GW/HAA

13 February 2014

Isaiah O. Durosaiye
PhD Research Candidate
The Grenfell-Baines School of Architecture Construction & Environment
University of Central Lancashire
Kirkham Building
Bhailok Street
Preston
PR1 2HE

Email: IODurosaiye@uclan.ac.uk

Dear Isaiah

R&D 1838

Study title:	An interdisciplinary approach to support age-friendly and inclusive workplace design in the NHS
REC reference:	Not applicable
IRAS project ID:	Non-portfolio

Thank you for submitting the above study for NHS R&I permission.

I am pleased to confirm that the Research Office has now received all necessary documentation, and the appropriate governance checks have been undertaken. This letter is issued subject to the research team complying with the attached 'conditions of permission', Trust SOPs, the DH Research Governance Framework, and any other applicable regulatory requirements.

List of documents reviewed as part of the Trust permission process:

Document	Version	Date
University Ethics Approval Letter	BuSH 18	10 January 2014
University Ethics Approval Letter - SWESH Research Degrees Sub-Committee		05 August 2013
Application for Research Programme Approval	RDSC2	
Consent Form – Focus Group Participants		
Consent Form - Managers		
Interview Questions – pilot/scoping – Focus Group		
Invitation to take part in research study – Focus Group		
Invitation to take part in research study - Managers		
Interview questions – pilot / scoping - Facilities Manager		
Interview questions – pilot / scoping – Human		

Trust Permission Letter	Page Number. **Page 1 of 4**

Resources Manager		
Interview questions – pilot / scoping – Occupational Health Advisor		
Participant demographic and gender information		
Participant information sheet – Focus Group		
Participant information sheet - Managers		
Documentation for NHS Letter of Access		

I would like to take this opportunity to wish you well with your research.

Yours sincerely

Mrs Gemma Whiteley
Head of Research and Innovation

Cc

Prof Karim Hadjri
School of ACE
University of Central Lancashire
Graduate Research School
Preston
PR1 2HE

Dr Champika Liyanage
School of ACE
University of Central Lancashire
Graduate Research School
Preston
PR1 2HE

Important: Please read and sign the **Conditions of Trust Permission** overleaf, and return to:

Heather Adams
RM & G Coordinator
The Centre for Health Research and Innovation
Royal Preston Hospital
Sharoe Green Lane
Fulwood
PRESTON

PR2 9HT

Please read, sign your acceptance & return a completed, signed & dated copy of this document to the Research Directorate, Royal Preston Hospital within one month of the date of the attached letter. Please also be sure to keep a copy of these terms and conditions in your research file for your reference. **R&D 1838**

Study title:	An interdisciplinary approach to support age-friendly and inclusive workplace design in the NHS
REC reference:	Not applicable
IRAS project ID:	Non-portfolio

Conditions of Trust Permission:

- The PI is accountable for the delivery and conduct of this study at LTHTR.
- All researchers involved in the study need to have received training appropriate to their role, covering aspects of Research Governance or Good Clinical Practice (GCP). GCP training needs to be renewed every 2 years.
- Studies involving medicines must be set up with, and supported by the Pharmacy Dept.
- The Research Office must be informed of:
    - The actual date the project is open to recruitment.
    - Any amendments / changes to the study documents throughout the course of the project.
    - Any changes to the management of the project.
    - Any extensions to the project, and associated additional funding, if applicable.
- The Research Office must be notified immediately of all Serious Adverse Events (SAEs) and Suspected Unexpected Serious Adverse Reactions (SUSARs).
- All research taking place on LTHTR premises is subject to the Trust monitoring programme, either as part of the annual 10% audit requirement or "triggered" monitoring. The Chief and/or Principal Investigator is required to make him/herself available for any monitoring visit.
- All Principal Investigators are required to provide recruitment (accrual) data to the Research Office monthly.
- The Research Office must be given a minimum three months' notice in writing if the Principal Investigator leaves the employment of LTHTR Trust.
- The Research Office must receive immediate notification if the Principal Investigator is unable to continue to fulfil his/her duties as PI for other reasons, e.g. long-term sickness.
- Any evidence of fraud and/or misconduct must be immediately brought to the attention of the Research Office, either via the Incident Reporting System, or by direct communication.
- The Research Office must be informed when the study is 'closed to recruitment' but participants remain in follow-up.
- The Research Office must be informed when the study is closed, by providing a copy of the close-out letter / report of study findings.

Failure to comply with any of the above may result in withdrawal of permission for the project and the immediate cessation of the research. Persistent failure to comply may result in disciplinary action.

I have read the general terms and conditions above and agree to conduct my research in accordance with Trust policies for the conduct of research.

Name of PI (please print): **Isaiah O Durosaiye** 17/02/2014

Signed: ....

Date: 17/02/2014

Trust Permission Letter	Page Number. **Page 4 of 4**

Appendix 3.6

NHS Letter of Access

Lancashire Teaching Hospitals NHS
NHS Foundation Trust

The Centre for Health Research and Innovation
Royal Preston Hospital
Sharoe Green Lane
Fulwood
PRESTON
PR2 9HT

Tel. 01772 52(2031)
Fax. 01772 52(3184)

CENTRE FOR HEALTH RESEARCH AND INNOVATION

Mr Isaiah Durosaiye
187 Kent Street
Preston
PR1 1PH

03 February 2014

Dear Mr Durosaiye

Letter of access for research:- 'An Interdisciplinary Approach to Support Age-friendly and Inclusive Workplace Design within the NHS'

I have reviewed your research passport application and supporting documents and we are satisfied that such checks as are necessary have been carried out by your employer and that you are appropriately qualified to undertake the research activity specified your project application.

This letter confirms your right of access to conduct research through Lancashire Teaching Hospitals NHS Trust for the purpose and on the terms and conditions set out below. This right of access commences on **01.02.2014** and ends on **01.02.2017** unless terminated earlier in accordance with the clauses below. You may request that the end date be extended by contacting the Research Directorate.

You have a right of access to conduct such research as confirmed in writing in the letter of permission for research from this NHS organisation. Please note that you cannot start the research until the Principal Investigator for the research project has received a letter from us giving permission to conduct the project.

You are considered to be a legal visitor to LTHTR premises. You are not entitled to any form of payment or access to other benefits provided by this NHS organisation to employees and this letter does not give rise to any other relationship between you and this NHS organisation, in particular that of an employee.

While undertaking research through LTHTR, you will remain accountable to your employer, **University of Central Lancashire** but you are required to follow the reasonable instructions of **Mrs Gemma Whiteley, Head of Research & Innovation** in this NHS organisation or those given on her/his behalf in relation to the terms of this right of access.

Where any third party claim is made, whether or not legal proceedings are issued, arising out of or in connection with your right of access, you are required to co-operate fully with any investigation by this NHS organisation in connection with any such claim and to give all such assistance as may reasonably be required regarding the conduct of any legal proceedings.

You must act in accordance with LHTR policies and procedures, which are available to you upon request, and the Research Governance Framework.

You are required to co-operate with LTHTR in discharging its duties under the Health and Safety at Work etc Act 1974 and other health and safety legislation and to take reasonable care for the health and safety of yourself and others while on LTHTR premises. You must observe the same standards of care and propriety in dealing with patients, staff, visitors, equipment and premises as is expected of any other contract holder and you must act appropriately, responsibly and professionally at all times.

You are required to ensure that all information regarding patients or staff remains secure and *strictly confidential* at all times. You must ensure that you understand and comply with the requirements of the NHS Confidentiality Code of Practice (http://www.dh.gov.uk/assetRoot/04/06/92/54/04069254.pdf) and the Data Protection Act 1998. Furthermore you should be aware that under the Act, unauthorised disclosure of information is an offence and such disclosures may lead to prosecution.

You should ensure that, where you are issued with an identity or security card, a bleep number, email or library account, keys or protective clothing, these are returned upon termination of this arrangement. Please also ensure that while on the premises you wear your ID badge at all times if provided, or are able to prove your identity if challenged. Please note that this NHS organisation accepts no responsibility for damage to or loss of personal property.

We may terminate your right to attend at any time either by giving seven days' written notice to you or immediately without any notice if you are in breach of any of the terms or conditions described in this letter or if you commit any act that we reasonably consider to amount to serious misconduct or to be disruptive and/or prejudicial to the interests and/or business of this NHS organisation or if you are convicted of any criminal offence. Your substantive employer is responsible for your conduct during this research project and may in the circumstances described above instigate disciplinary action against you.

LTHTR will not indemnify you or your employer against any liability incurred as a result of any breach of confidentiality or breach of the Data Protection Act 1998. Any breach of the Data Protection Act 1998 may result in legal action against you and/or your substantive employer.

If your current role or involvement in research changes, or any of the information provided in your Research Passport changes, you must inform your employer through their normal procedures. You must also inform your nominated manager and the R&D Department at this NHS organisation.

Yours sincerely

Mrs Gemma Whiteley, Head of Research & Innovation
Lancashire Teaching Hospitals NHS Foundation Trust

Appendix 4.1

Exploratory Interviews Questions – Occupational Health Advisor

Study Title: ***An Interdisciplinary Approach to Support Age-friendly and Inclusive Workplace Design within the NHS***

1. How would you describe an **age-friendly workplace**?
2. How would you describe an **inclusive workplace**?
3. Would you consider **your NHS establishment** an **age-friendly and inclusive work environment**, and if so, **how** and **why**?
4. Do you classify jobs based on the **physical, cognitive and sensory demands** it places on the job incumbent?
5. How would you decide on the appropriate **fit between the worker and the job demands**, taking into account potential prevalence of limitations to physical, cognitive or sensory capabilities of members of the **older worker groups**?
6. Do you think that the **workplace** needs to be **adapted** to accommodate workers of various **physical, cognitive and sensory** capabilities? If yes, can you please name any areas that require special attention?
7. Are you aware of any **social or behavioural issues** caused by the **design** of work environments within your NHS Establishment?
8. In the last 2 years, have you had any **instances** when **adaptation of the work, or the work environment** or other issues have required the replacement of a worker (either temporarily or permanently), as a result of **age-related** health conditions? If so, please explain the circumstances.
9. Are you aware of any **job types** within the NHS establishments that are particularly appealing to **older worker groups**, and if so why?
10. Do you think that the **design of the physical work environment** matters and makes a difference to **older workers**? If yes, in what ways?
11. Do you have any comments on any particular aspects of the **workplaces** within your NHS establishment that you think **affect older workers**?

Exploratory Interviews Participants Profile

Participants	Job Title	Age Group (years)	Gender
PE1	Older Nurse	More than 60	Female
PE2	Older Nurse	50-59	Female
PE3	Occupational Health Advisors	40-49	Female
PE4	Occupational Health Advisors	50-59	Male
PE5	Portering Services Manager	40-49	Male
PE6	Human Resource manager	50-59	Female
PE7	Hotel Services Manager	50-59	Female
PE8	Human Resource manager	40-49	Female
PE9	Facilities Manager	40-49	Male
PE10	Facilities Manager	50-59	Male

Appendix 5.1

Interview Record Sheet

(Ward nurses)

Full title of Project: An Interdisciplinary Approach To Support Age-friendly & Inclusive Workplace Design within the NHS

Name of Interviewee	
Department/Organisation	
Job Title/Position	
In this position since	
Length of Service with NHS	
Date of Interview	
Time of Interview	
Venue	

Name of Interviewer	
Notes	

1) How long have you worked for the NHS and how long have you been in your current position?

2) Do you consider yourself fit and well? Do you feel fit in your work environment as a ward nurse?

3) What type of ward do you work on?

4) How many beds are on the ward?

5) Do you typically work day or night shifts? Percentage split?

6) On a typical shift, please describe the nature of the work of the healthcare team. Please tell us about your role in this team?

7) On a typical shift, please give examples of the tasks you perform and group them in the following categories**: i) patient care; ii) patient surveillance; and iii) patient support.**
Patient care are tasks performed directly on, and requires interaction with patients, e.g. medication, bathing, feeding, moving and handling, etc. Patient surveillance are tasks that do not require physical contact with patients, but are necessary for patient health, safety and wellbeing, e.g. watching, checking, listening, safeguarding, etc. Patient support are the tasks that you perform away from patients and do not require the presence of patients, but are nevertheless necessary for patient health and wellbeing, e.g. consultation with a other social workers and other caregivers, advising and supporting family members, etc.

	Nurse-Patient Interaction		
List of tasks	**(i) Care**	**(ii) Surveillance**	**(iii) Support**

8) How would you describe the physical demands of the nursing role on the ward?

9) What support or help are at a nurse ward disposal in meeting these physical demands?

10) How would you describe the cognitive demands of the nursing role on the ward?

11) What support or help are at a ward nurse disposal in meeting these cognitive demands?

12) How would you describe the sensory demands of the nursing role on the ward?

13) What support or help are at a ward nurse disposal in meeting these sensory demands?

14) Please name the most frequently performed moving and handling tasks as a ward nurse.

15) Please explain the adequacy of the space, equipment and technique at your disposal to perform these tasks.

16) Do you consider your ward to be a fast-paced work environment? If yes, please name the key tasks of your job that you think require more attention (in time or approach)?

17) How does ward layout affect your ability to move around and perform your duties?

18) Does **signage** improve your **way-finding** abilities?

19) Do you think that **colour schemes** would help in identifying types of spaces and in supporting **way-finding** in large wards?

20) How do **building materials** and finishes typically used in wards affect your ability to perform your duties (e.g. do you find shiny surfaces problematic?).

21) How would you describe the **noise level in your ward?**

22) Does the noise level and/or noise insulation affect your **task performance** in any way**?** If yes, please describe**.**

23) What would you suggest should be **changed** in the way wards are **designed and used?**

24) Please describe the **major risks** associated with the ward nurse role.

25) Please name the **key areas** of the ward nurse role that you think require special attention in order to avert such risks**.**

26) Please tell us about any **training and other continuous professional development courses** you have attended in the last one year**.**

27) How would you describe **the adequacy of the trainings to real life situations?**

28) What further **training needs** would you suggest?

29) Are there any other aspects of your job that we did not cover and you feel are **important in supporting your duties?**

Appendix 5.2

Completed Nursing Tasks Data Collection Sheet

P1

Categorisation of nursing tasks

Study title: An Interdisciplinary Framework To Support an Age-friendly Workplace in the NHS: A Case for Older Nurses

Please give examples of the tasks that ward nurses perform and group them in the following categories: i) **patient care; ii) patient surveillance; and iii) patient support.**

Please read the description of the task groups as follows:

Patient care are tasks performed directly on, and requires interaction with patients, e.g. medication, bathing, feeding, moving and handling, etc. Patient surveillance are tasks that do not require physical contact with patients, but are necessary for patient health, safety and wellbeing, e.g. watching, checking, listening, safeguarding, etc. Patient support are the tasks that you perform away from patients and do not require the presence of patients, but are nevertheless necessary for patient health and wellbeing, e.g. consultation with a other social workers and other caregivers, advising and supporting family members, etc.

Name of participant	[redacted]
Name of Ward/Department (e.g. orthopedics)	[redacted]
Date completed	22.6.15

1

Please tick the boxes to indicate which groups a task belongs to. If a task belongs to more than one category, please indicate all that is applicable.

	List of tasks	Patient-Nurse Interaction		
		(i) Care	(ii) Surveillance	(iii) Support
1	BATHING, TOILET Hygiene, mouth care	✓	✓	
2	Bedmaking	✓	✓	
3	Observations TPR, BP, sats etc	✓	✓	
4	Hoisting patients from bed to chair + vice vera	✓		
5	Replacing mattresses + turning mattresses			✓
6	checking commodes, top + underneath			✓
7	Feeding patients, handing out food + drinks.	✓	✓	
8	Basic dressings, removing venflons.	✓	✓	
9	Collecting blood from blood bank		✓	✓
10	Escorting patients to and from procedures	✓		

	List of tasks	(i) Care	(ii) Surveillance	(iii) Support
11	weighing patients twice weekly	✓		
12	Cleaning Rota.		✓	✓
13	Constant general observations, wet floors, pt. wearing slippers, ~~no~~ trailing wires from beds or machinery, listening to patients' concerns	✓	✓	✓
14	Applying + measuring for TED stockings.	✓		
15	Emptying + recording body fluids, drains catheters	✓	✓	
16	Completing paperwork necessary to a task	✓	✓	✗
17	Speaking with relatives, doctors, physios, other nurses, specialist nurses, dietician, kitchen staff			✓
18	Putting away ward stock.			✓
19	Collecting of specimens from patients.	✓		
20	Blood glucose monitoring.	✓		✓
21	Answering patients' call buttons.	✓	✓	
22	Cleaning up ~~bot~~ bodily fluids, ie vomit, urine + faeces	✓	✓	✓
23	Answering telephone			✓
24	Ordering of mattresses + seat cushions.			✓
25	moving beds around the ward	✓		
26	Assisting in cardiac arrest.	✓	✓	✓

Appendix 5.3

8 June 2015

Invitation to take part in research study – Interview

Study Title: An Interdisciplinary Framework To Support an Age-friendly Workplace in the NHS: A Case for Older Nurses

Dear colleague,

My name is Isaiah Durosaiye, a PhD research candidate at The Grenfell-Baines School of Architecture, Construction and Environment, University of Central Lancashire (UCLan), Preston.

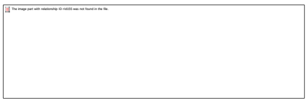
You are kindly invited to participate in this research study, which is organised and fully funded by UCLan. The aim of this research is to develop a framework that supports an age-friendly workplace within the National Health Service (NHS). This research study shall examine how the relationship between older nurses and the work environment influences older nurses' work ability and their decision to continue to work in older age within the NHS.

As part of this research, I would be grateful if you could allocate 30 minutes of your valuable time for a face-to-face interview with me, during which you will be invited to answer specific questions regarding the work environment of older nurses. The objective of this interview is to identify the characteristics of older nurses' work environment in order to establish whether a person-environment relationship exists with regard to the physical environment and if these workplaces as a whole have been designed or adapted to provide an age-friendly work environment, and if not which specific job and/or work environment demands need further attention.

Please take some time to read the attached participant information sheet for details of the research. If you do decide to participate in this study, I would appreciate if you could indicate your interest on any of my contact details below, after which we shall contact you to arrange a convenient time for the interview.

Thank you very much for your cooperation and please do not hesitate to contact me if you have any questions.

Yours faithfully,



Isaiah Durosaiye

PhD Research Candidate

Grenfell-Baines School of Architecture, Construction & Environment

University of Central Lancashire

Kirkham Building,

Bhailok Street

Preston PR1 2HE

Email: iodurosaiye@uclan.ac.uk

Appendix 5.4

15th June 2015

Participant Information Sheet – Interviews

Study title: A Framework for Assessing Nursing Tasks and Environmental Demands

Invitation to take part in this research

You are kindly invited to take part in this research study. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take some time to read the following information carefully.

Purpose of the study

The purpose of this study is to identify the physical and environmental factors that enhance or inhibit older nurses' work ability in the work environment. This study is expected to provide evidence-based knowledge about the personal and environmental needs that are specific to older nurses in certain roles within the National Health Service (NHS). From this greater understanding, a framework can be developed to support age-friendly workplaces across the NHS with respect older nurses.

Research rationale

A recent study suggests that by 2030 there will be 51% more people aged 65 years and over in England compared to 2010. Likewise well over 10.7 million people are currently expected to retire with inadequate pension incomes, because of the current ageing and other socio-economic trends, such as decreasing fertility rates and improving life expectancy. Hence, the proportion of older workers (workers aged 50 years and above) in the UK workforce is expected to increase significantly within a couple of decades (www.parliament.uk, 2013). It is therefore imperative for policymakers and other interested groups to take action in order to develop the inherent benefits of an ageing workforce.

The NHS is the largest employer in England with more than 1.3 million staff members. Moreover, the NHS Trusts and organisations control and manage hospital estates and facilities in England with gross internal site floor area in excess of 28 million m^2 (Health and Social Care Information Centre, 2013). The personnel figures and the large work areas position the NHS as an ideal case study for this research because it is presumed that, compared to other workplaces and employers, the changing trends in the age profile of the NHS workforce could potentially have the greatest socio-economic impact in the UK.

Why have I been invited to participate?

You have been invited to participate in this research because your experience as a member of staff can make a valuable contribution to the body of knowledge essential for the design of an age-friendly workplace within the NHS.

What will the study involve?

As part of the research we would like to interview older practising nurses, occupational health advisors, human resource managers and facilities managers of participating NHS Trust establishments. We would like to gather information on the appropriateness of the physical work environment and determine whether or not there are any constraints on the working ability of older nurses, typically 50 years and above.

Do I have to take part?
You do not have to take part. Your participation is entirely voluntary. If you decide to take part you are still free to withdraw at any time and without giving a reason. All information used will be anonymous.

Can I withdraw my data after my participation?

Yes. Participants may request that their data not be used even after undertaking an interview. However, it will not be possible to withdraw anonymised participant information after final analysis has been made.

What will happen to me if I take part?
You will be interviewed. At the start of the interview, your consent will be requested to either audio record or take hand written notes of the interview for transcription purposes. You will then be given the opportunity to discuss any questions, and will be asked to sign a consent form. The interview should take approximately 30 minutes.

Are there any risks or costs associated with the activity?
There are no risks or costs associated with this activity. However, your contribution will be in kind in form of staff time spent undertaking the interview.

Where and when will the interview take place?
The interview will take place in a meeting room at your NHS premises at a time previously agreed with you.

What are the possible benefits of taking part?
You will be able to inform the research by sharing your experience, as a member of staff of the largest employer in the UK (and one of biggest organisations in the world). Your views and opinions will contribute to the development of a framework to support an age-friendly workplace for older nurses within the NHS.

Will what I say in this study be kept confidential?
All information collected during the session will be kept strictly confidential (subject to legal limitations). Confidentiality, privacy and anonymity will be ensured in the collection, storage and publication of research material in accordance with the University's policy on Academic Integrity. All data collected, as part of this research, will be kept securely in paper or electronic form for 5 years, and will then be destroyed.

What should I do if I want to take part?
All you need to do is indicate your interest to participate to the Researcher by email on: iodurosaiye@uclan.ac.uk. We shall then contact you to agree a time that is convenient for you to be interviewed.

What will happen to the results of the research study?
The results of the interviews will be analysed and validated against other evidenced-based research findings in order to develop a framework to support an age-friendly workplace for older nurses within the NHS. It will be reported in the research thesis and a paper will be published in an academic journal.

Who is organising and funding the research?
This research is funded by the Grenfell-Baines School of Architecture, Construction and Environment at UCLan.

Who has reviewed the study?

This research has been approved by the University Research Ethics Committee.

Contact for Further Information
If you have questions about this study and the interview, please contact Professor Karim Hadjri, Grenfell-Baines School of Architecture, Construction and Environment, University of Central Lancashire, Harris Building, Corporation Street, Preston PR1 2HE. tel: +44 1772 893813. fax: +44 1772 892916. email: khadjri@uclan.ac.uk

What do I do if I have any issues or complaints?

If you have any complaints about this research or researchers, please contact Professor Akintola Akintoye, Dean, Grenfell-Baines School of Architecture, Construction and Environment, University of Central Lancashire, Harris Building, Corporation Street, Preston PR1 2HE. tel: +44 1772 893211. fax: +44 1772 892916. email: AAkintoye@uclan.ac.uk

Thank you for taking the time to read this participant information sheet.
Yours sincerely,

Isaiah Durosaiye

PhD Research Candidate

Grenfell-Baines School of Architecture, Construction & Environment

University of Central Lancashire

Kirkham Building,

Bhailok Street

Preston PR1 2HE

Email: iodurosaiye@uclan.ac.uk

Appendix 5.5

CONSENT FORM – Interview

Full title of Project: An Interdisciplinary Framework To Support an Age-friendly Workplace in the NHS: A Case for Older Nurses

Name, position and contact address of Researcher:

Isaiah Durosaiye

PhD Research Candidate

The Grenfell-Baines School of Architecture, Construction and Environment

University of Central Lancashire

Kirkham Building, Bhailok Street, Preston PR1 2HE.

tel: 01772 896491 fax: 01772 892916 email: iodurosaiye@uclan.ac.uk

	Please initial box
I confirm that I have read and understand the information sheet, dated 15 June 2015 for the above study and have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	☐
I understand that my participation is voluntary and that I am free to withdraw at any time, without giving reason.	☐
I agree that my data gathered in this study may be stored (after it has been anonymised) in a specialist data centre and may be used for future research.	☐
I understand that it will not be possible to withdraw my data from the study after final analysis has been undertaken.	☐
I agree to the interview being audio recorded.	☐
I agree to the use of anonymised quotes in publications, conference papers, presentations, research reports and research thesis.	☐
I agree to take part in the above study.	☐

____________________ _______________ ____________________

Name of Participant Date Signature

____________________ _______________ ____________________

Name of Researcher Date Signature

Appendix 5.6

Participants Details Form

Participant Demographic and Gender Information

(Interviews)

Full title of Project: An Interdisciplinary Framework To Support an Age-friendly Workplace in the NHS: A Case for Older Nurses

Name, position and contact address of Researcher:

Isaiah Durosaiye

PhD Research Candidate

The Grenfell-Baines School of Architecture, Construction and Environment

University of Central Lancashire

Kirkham Building, Bhailok Street, Preston PR1 2HE.

tel: 01772 896491 fax: 01772 892916 email: iodurosaiye@uclan.ac.uk

	Please initial box
I confirm that I have read and understand the information sheet, dated 15 June 2015 for the above study and have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	☐
I agree to the use of information about my age group and gender, as indicated below, in an anonymised form. Please also tick the applicable boxes below.	☐
Up to 39 years ☐ 40-49 years ☐ 50-59 years ☐ 60 years & above ☐	
Female ☐ Male ☐	

_______________ _______________ _______________

Name of Participant Date Signature

_______________ _______________ _______________

Name of Researcher Date Signature

Appendix 5.7

<u>Sample of NVIVO Transcript - Interview</u>

Line	Content	Speaker
1	Q1	R
2	I have worked for the NHS for twenty three years. As a staff nurse I have been qualified 20 years.	P4
3	Q2	R
4	Yes. Yes.	P4
5	Upper GI surgical ward. GI is gastro-intestinal. Largely we are involved with the oesophagus and the gastrum.	P4
6	Q4	R
7	22 beds	P4
8	Q5	R
9	Both. Day: 80%; Night: 20%.	P4
10	Q6	R
11	The shifts start with the handover in the morning. Then it bed making and washing. Probably dispensing some control drugs early in the morning that people are due. Giving out breakfast. Depending when different surgical teams arrive, it is a ward coordinator, can't do all the ward rounds, I may take part in some of the ward rounds. So say what ward rounds. So the ward round is when doctors are evaluating and making treatment plans for patients.	P4
12	Are you usually involved in these ward rounds on a daily basis?	R
13	It varies on a day to day basis. It just depends what time they arrive. Three team could arrive on the ward at the same time and we sort split it up between us. If can, the ward coordinator would do them all, but it is not possible if different people arrive at the same time and they just got to adjust their workload as they see fit to see their patient. So we just work it out between us.	P4
14	But a nurse, a qualified staff nurse must be part of the team doing this evaluation.	R
15	Yeah. There is more to it that is just part of it. It is a lot more than that. After	P4

the ward round, then we are carrying out various treatments that the doctors have prescribed as well. Which could mean a lot of different things. It could be some changes in drug management. Different fluid management for the patient. Taking drains out. Putting the NG (nasogastric) tubes in. There is lots of different therapies we could be doing for the patients following the ward rounds.

16 That would be as a result of the ward round? R

17 Yes, as a result of the ward rounds. So there is changing treatment going on and as part of that, those therapies that are all changing in treatment, they are being carried out, it is up to the staff to implement them. P4

18 Good. So the ward round is actually a kind of collaborating effort among all the medical team? R

19 Well there is lead consultant for the team to the ward round and he would evaluate the patient and make management plans for that patient for that day and they do a ward for every patient every day on surgery. P4

20 Every day there should be a ward round once a day? R

21 Yeah. P4

22 Q7 R

23 There is washing the patient. That will cover care and surveillance, because we are actually examining the patient. We are looking at the pressure areas. We are looking for pressure damage. We will be looking at wounds at the same time. And that is sort of therapeutic as well, because we give catheter care and things like that at the same time. So, if there is any moisturiser and things people will be applying them at the same time. So it is very much care and surveillance at the same time, like washing the patient. Feeding the patients, and that is care and surveillance, because we monitor intake and output. We look at what comes out of people's bowels and what come as people's urine. Bowels are very important. We get diarrhoea. We have something we are doing in this surveillance really. Measuring urine and bowels, I would say it is really about surveillance and that is part of it if you will. P4

24 So feeding is a group of tasks that requires you to measure both intake and output? R

25 We are monitoring output as I said. So that would be faeces and urine. But we also have other outputs, we have tubes up in the nose and we have various drains in people and we monitor continuously what is coming out of those. P4

26 So that would be surveillance? Or both care and surveillance? R

27 I would say surveillance. P4

Observations. You know we do blood pressures, pulses, temperatures, respirations. We do pain score, nausea scores. If I was to say to you, have any pain and we have you to express it in numeric form. So we have a scale. We have naught to three. Naught is no pain, one is mild pain, two is moderate pain and three is severe pain. The worst pain you could possibly imagine. Invariably people will say it is ten. But ten does not exist on our scale. So we would score somewhere with a pen. But, that is surveillance, then we would provide care as well. So if somebody is complaining about pain we want to be able to do something about it. And when we do something about it, the pain helps us to know whether what we are doing is working. And then you would want to do more surveillance to see if what you are giving is working. No matter what you are doing in life, you have some sort of...I sm sure you do it in architecture, you evaluate something. You plan and then you evaluate. And you structure things accordingly. I am sure you have something similar in architecture.

Wound care. That would fall under care and surveillance.

Medications. It would be care. Surveillance? Yes, it has got to be in surveillance as well to monitor what affects people and impacts drugs have on people as well. So anything else...?

Documentation. That's surveillance primarily.

28 I am bent to say it is support because I mean, for example when you say documentation, do you have to see the patient? You don't have any interaction with the patient. R

29 I have to see the patient. But that documentation would be an evaluation of those previous things. P4

30 But does the patient have to be present? R

31 Not necessarily. P4

32 I would count that as support then. Because you are doing it away from the patient, you can do it on your desk, you can do it on your computer. It doesn't require the presence of the patient. R

33 The documentation is part of surveillance as well, because it is part of our monitoring. P4

34 When you are going you carry your notebook or your charts with you, is that what you are saying? R

35 But I would be at the patient bedside doing it. But the patient might be necessarily be there. They could be sat in here watching television. Or they could be in CT scanner, they could be having an x-ray somewhere, but i have still got my documentation to do. But it is related to all these things. P4

36 Communication with staff. I would say that is support really, isn't it? P4

37 Then there is referrals to other disciplines which might be social workers, physiotherapists, liaising with pharmacy. Negotiating slots in xray. CT scan, making sure people are prep for them. I would say that is mostly support.

38 Q8 R

39 Very busy. I have had a break today. But I can go full shift at times and I P4
would come in in the morning and will not have a break and would have a drink. It can be that busy. And I can be going off late. So an eight hour shift can turn into a ten hour shift, without a break. This isn't particular to this ward. You would find this is something that is very general with nurses. I have had a break today. I should go off on time as well, it this doesn't carry on too long. It can be very busy. It's been a nice day today. The patients haven't been demanding. The staffing has been alright on the ward. But can can change on a day to day basis. The demands of the patients can get greater. The wellness of the patients can change dramatically. There's a lot of things that will affect that. So we are just generally very busy. Well this is not a busy day. There are days when it can be very busy and I don't have a break. I have had a break today. I found time for you and I would still get off on time, I hope.

40 You have mentioned not having a break, and the shift stretching over the R
normal hours of shift, which makes it physically demanding. How does that affect physicality, in terms of the demands on your body?

41 You feel quite tired shift after shift and I am not young anymore. You know P4
about the European legislation, on work time regulation? The law says we should have eleven hour break between shifts. We don't. Our late shift finishes at half past nine. Our early shift starts at seven o'clock. That is not an eleven hour gap. But I have brought this up before, but there is no willingness in the nursing staff to want to change things. I have seen hospitals that have done something about it. But this Trust has never done anything about it. They seem to think it is impossible to do something about it. And it is hard work after a busy late shift. I have left here... not in probably last two years, but I can think of occasions when I left the ward at 12 o'clock at night when I should have left at half nine. And then come back in for an early shift in the morning. It happens. I haven't done it for a couple of years, but very often I might be leaving at ten o'clock or half past ten. But generally speaking, I am usually leaving just before ten o'clock.

42 Are you paid overtime? R

43 No. Very, very rarely. And time away is a nonsense. P4

44 Q9 R

45 I don't think we get a lot of support, to be honest. I think we are just expected P4
to get on with it.

Can I just say that I am a person that believes in my job. And I'd turn up for work all the time. And I haven't had a day off sick for four years. Despite all these, I love my job and I like coming here. And I like putting the effort in. Because, apart from the physical side of it, I get a lot of rewards from it as well. I derive pleasure from people getting better. And somebody saying 'thank you' isn't a reward enough, believe me! Funny enough though, people die on this ward, but if people die well, it can be quite rewarding as well.

46 How can people die well? R

47 Well, they die comfortably. Some people know they are dying, but if somebody dies comfortably, and the family is with them. I think people can die well, if we give them the right support. And I think it is something we are getting better at. P4

48 Q10 R

49 You have got to have the mind of the places at the same time. Keep a lot of stuff to memory. And I would be very honest. I am fifty seven now. My memory is not as good as it used to be aned it gets more difficult. And I am getting more forgetful than I used to be when I was like in my thirties when I first started my nursing career. P4

50 So you think the key and the most demanding aspect of the nursing role from the cognitive perspective is the memory? R

51 It is not all that. You've got to retain a lot of knowledge. As you get more experienced, people rely on you more as well. If you have a lot of junior staff on the ward. They are like coming and asking you things. And asking you for advice, so as a senior nurse, my demands are on me more than a junior member of staff; they will get on with what they are doing, and do as much as they can. But when they can't do things, they come to the senior staff to ask them for advice. And believe me that's me, everybody seems to be picking on me. They seem to think I am the oracle, but I am not. I am very knowledgeable at my job. I have been working in surgical wards for a long time and I do know what I am doing, so people do come to ask me for advice with things. So that side of things quite demanding, so as well as my group of patients that I have got to look after, I have also got the amount of other staff needing help with their patients as well. P4

52 That's interesting. It is good you are mentioning this. R

53 Q11 R

54 Again, very little. We are just expected to get on with it. P4

55 Q12 R

56 I am a man. I do not multitask. I can only do one thing at a time and people often... you'll be writing something and people are talking in the rear and I cannot do both. I say to people, 'if you want my attention, get my attention'. And I don't mind people prodding me and poking me and saying 'listen to me'. Because, if I am in my zone and I am writing or doing something I am not listening. So I don't multitask. I need to do that one thing at a time. That's P4

the perspective on it. We've got to be good listeners, we've got to be good observers. We've got look at changes in patients. When, as you get more experience, you can look at a patience and know their need, you know. There is a lot of sensory demands that look in somebody's eye, you can see the jaundice. There is a lot of things you can see just by looking at patient's face. And you know, so there is a lot of sensory things about the job, you know. Touch somebody, are they cold, are they calm, things like that, you know. It is not just about what we do with observation. It is hard to put this in words really. But it is gut feeling we have as well. Gut feeling. Sometimes you just know something is not right. And then you've got to define what it is, before you can pass it on to somebody, you know. I do believe in a nurse's gut feeling, when somebody say someone is not well, but I don't know what it is.

57 Q13 R

58 Very little. I am repeating myself. P4

59 Q14 R

60 Repositioning people on the bed. P4

Standing and walking patient. Either sitting from a chair, moving them on the bed, standing them and walking them as well.

I won't say frequently, rolling for pressure relief.

61 Q15 R

62 Well the space is appalling. You are trapped in little gaps between curtains and beds and there is table on the other side. There is patients and relatives you are bumping into while you are doing things. And the space is appalling. We've got a little side room at the bottom. We can only just walk round the bed and we are expected to perform tasks in there. It is appalling the space provided. P4

Equipment-wise, I used to have a lot of trouble with my shoulders and we've got the electric beds now and now since we've got the electric beds in I have not had any trouble with my shoulders at all. So that has been a big improvement for me. We've got hoist for lifting patients for various tasks. We have the availability of things like that. And we are quite... on this ward we have a lot more toilets and bathrooms than most wards. We quite well equipped from that point of view.

63 When you say electric bed, does it mean? R

64 It sits up, the feet you can elevate the legs you can put it almost in chair position. So they are quite good really. You've still got to sometimes slide the patient up the bed. For generally speaking, if it is a case of sitting them forward, you are not having to drag them forward anymore. Only the bed will come up for them. And that makes my life a lot easier. P4

65 Q16 R

66 Yes. P4

This is hard to say because every aspect of patient care has its demands. And washing the patients seems to be very important and you can't say that is less important than doing medication. So, everything has its demands. Because as a staff nurse, it is my job to make sure all these tasks are performed for my patients and it might not be just me doing it. I have got make sure it is delegated and I people are carry out the tasks. So I find it very difficult to say which is taking up most of my time and which is causing the most pressure. Because it is all causing pressure and demands on me. Not just me personally, I have got to make sure there is enough staff and jobs are allocate fairly.

67 Q17 R

68 This ward is a lot better than most. And I was saying about the bathrooms and things that you've not got as far to walk patients to bathrooms. There is more availability of bathrooms and I do think we've got a lot of positives here. I think we could do with more spaces between beds. I have said this before, the layout isn't that good as far as the beds are concerned. You could definitely do with more space. But generally speaking, I think we've got most things we need on the ward. It is nuisance when one thing is at one end of the ward and you've got to walk right down to the other end of the ward to get it. You can't keep everything in the middle of the ward; that is just impossible. So everything is a compromise. Because the shape layout of the ward is a corridor with rooms off and bays with beds in and you can't put everything in the middle of the ward. You'll have to have a round ward with a centre store and that would be impossible. You can't put everything in the middle can you? So there is got to be some walking. I think we are a lot better than most wards in our layouts. P4

69 Q18 R

70 I hate signage. I think there is far too much many posters and things stuck on walls. And people see so many, it is too many to look at, so I don't find signage helpful at all. And ypu see, patients, and visitors, they are looking at the signage and they are lost. I am not the only person who would stop and say 'do you need any help?' and help them find somewhere, because I just think signage is very poor. Too much, just confuses people. P4

If you go round the hospital, there is myriad of posters and signs, things telling you about this and various services and charities and everything. And you just bombarded by it everywhere. Our notice board in the staff room, there is that much stuff stuck on it. No I don't like signage.

71 Q19 R

72	I am only going to say possibly with that. It depends on how well it is thought through and well it is designed.	P4
73	Q20	R
74	There is a lot things with the design of the ward. You see, we have these kerbs on the floor, that's so that you can get dusts gathering up in the corners. And there's a lot things to talk about when they design a ward. And this ward was six years ago it was commissioned. So it is quite sort of modern in its outlook really. There's still various places in the hospital where you'll find corners with dirt. I am sure know this as an architect, that kerbs don't gather dust. So there are things about the environment. We've still single glazing on this ward. And those bays can get damn cold and you having to do something to keep patients warm. And then somebody turns the boilers up and then it gets too hot. Then you're having to open the windows, because we haven't got proper air-conditioning. So things aren't perfect.	P4
75	Q21	R
76	Do you know people have been commenting it is noisy today and it is not bothering me. I don't find it personally offensive the noise on the ward, it just turns into a jumble in the background. But there are all sorts of alarms and beeps and things going on from various machines and sometimes it turns into a bit of a jungle in your mind and you don't respond to things as quickly as you should when there's loads of noise going on.	P4
77	Q22	R
78	I think sometimes the noise level disturbs the patients, you know. It doesn't bother me in my tasks. But we get porters coming and banging around with trolleys in the middle of the night on the link corridor. They make a hell of a noise and you have to go and tell them off sometimes. But it doesn't bother me personally.	P4
79	Q23	R
80	In an ideal world all the patients should have single rooms with doors shut, so they can have a nice quiet night sleep.	P4
81	Q24	R
82	I think to a degree we feel threatened a lot. Because the job is so busy. Sometimes a big worry in your mind have remembered to do everything? And because we have a governing body that's designed is to look after the patients and not us, there is threat to us. Because nurses get struck off for silly little things in my mind sometimes. And it is a threat to us. You worry about 'Have I remembered to do everything?' 'Did I pass on the things that weren't done?' And it becomes a worry sometimes. So that is what I would say it the biggest threat to me.	P4
83	The threat of making mistakes, for example, is that what you are saying?	R

84 Making mistakes and overlooking things. And missing something. P4

85 Q25 R

86 More staff. More trained staff. So we reduce the staff to patient ratio. Because this morning I am looking after half the ward. So I have got eleven patients to look after. Believe, sometimes I get moved to wards and I could be looking after seventeen patients. P4

87 What is the official rate? R

88 There isn't anything in law. I think the Prime Minister was making some noise a couple of years ago about one to eight. I think that would make my life very pleasurable. But it doesn't happen and I don't think there is any actual legislation about it. There are a lot of guidelines out there. But there is nothing actual. P4

89 Q26 R

90 I haven't done any courses in the last one year. The last one I did was two years ago, which was a nutritional course. I have decided in my mind that I am on wind down now. I have got two years, five months and nineteen days till I retire. Because I am finishing when I am sixty. I do think there's got to be an end to this. And that's my plan. I am finishing and when I leave I am not coming back part time, I am going. Much as I enjoy my job and much as... I am quite happy coming tom work at the moment. I can't see me doing this till I am sixty five and sixty seven. There is no way I can keep this up. P4

91 This is the key thing you have just mentioned. R

92 I can't keep this up when I am in my sixties. And I find it more and more tiring, and I do. There's got to be an end to this. As I am getting older I am getting more forgetful. That could land me in trouble. So I do want there to be an end to it. And, I mean, I could finish at fifty five. But I don't feel like I am ready for retirement yet. And my plan is to work till I am sixty. But if they upset me too much I am out of the door. Because I could actually afford to retire if I wanted. But I am quite happy coming to work at the moment. But there is going to be an end to it. My plan is to finish when I am sixty. P4

93 And that's a couple of more years to go? R

94 Two years, five months and nineteen days... P4

95 And you're ticking the boxes every day. R

96 No. I have got an app on my phone doing the countdown for me. And I would show to these people who've got forty years to do. P4

97 Q27 R

98 I think..., I am one of the oldest trained nurses and I think I was better prepared for working on a ward when I qualified. And of course I have P4

learned a lot since. I think we get courses that meet our needs. But there is on the job learning all the time. And I do feel adequately equipped to carry out my job within time constraints. So I do feel that the courses I have had and everything over the years and have met my needs. And I do feel like I am capable to do the job.

99 Q28 R

100 Retirement courses. What to do when I retire. I have got plenty of plans on what I am doing when I retire. And I won't really need a lot of help. P4

101 Q29 R

102 I think there are occasions when I there is something traumatic happen on the ward. And there is never any support for people afterward. May be a bad death. May be some sort of incidence on the ward. We get violent patients. We get verbally abusive patients. These people we just have to put up with them, the violent ones. When the traumatic incidence struck, there is no any counselling, not any backup. There is nowhere to go to. No body come to say 'Are you alright?' 'Do you need any help?' 'Do you need any time off?' We are just expected to get on with things. Just carry on. And it is very much the way nurses work, they just get on with it. Policemen would go off on traumatic stress when they see someone die. But it can be quite upsetting that sometimes. I have had one or two patients in my career that, you know, they've been quite upsetting the deaths. And I have slept for a few nights afterwards. I found a patient hanging in the bathroom once. He survived thankfully. Trying to commit suicide, I found him hanging in the bathroom. Fortunately we saved his life. But these things are very traumatic. They can be very upsetting. But there is never any support there afterwards: 'Oh are you alright?' 'Do you need anything?' 'Do you want a bit of a break from this?' So nothing like that. You are just expected to get on with it. P4

103 What sort of support do you think, like psychotherapist? R

104 Well I think some counselling, but not everybody wants counselling. I am not sure. I as a person want counselling. May be there is a time when you should be offered a bit of a break or doing something else, to distract you, just to get you away from the situation. P4

Appendix 5.8

Investigate Interviews Participants Profile

Participants	Job Title	Age Group	Gender	Name of Ward	Type of Ward
P1	SHCA	50-59	Female	Upper Gastrointestinal Surgical	Inpatient
P2	staff nurse	50-59	Female	Ophthalmology Surgical	Day case
P3	SHCA	Up to 39	Female	Upper Gastrointestinal Surgical	Inpatient
P4	staff nurse	50-59	Male	Upper Gastrointestinal Surgical	Inpatient
P5	SHCA	40-49	Female	Upper Gastrointestinal Surgical	Inpatient
P6	staff nurse	Up to 39	Female	Upper Gastrointestinal Surgical	Inpatient
P7	staff nurse	Up to 39	Female	Upper Gastrointestinal Surgical	Inpatient
P8	staff nurse	50-59	Female	General Surgery	Inpatient
P9	staff nurse	Up to 39	Female	Gastroenterology Medical	Inpatient
P10	staff nurse	Up to 39	Female	Gastroenterology Medical	Inpatient
P11	staff nurse	40-49	Female	Gastroenterology Medical	Inpatient
P12	staff nurse	Up to 39	Female	Gastroenterology Medical	Inpatient
P13	SHCA	Up to 39	Female	Gastroenterology Medical	Inpatient
P14	staff nurse	Up to 39	Male	Gastroenterology Medical	Inpatient
P15	staff nurse	Up to 39	Female	General Surgery	Inpatient
P16	staff nurse	Up to 39	Female	General Surgery	Inpatient
P17	sister	40-49	Female	General Surgery	Inpatient
P18	staff nurse	40-49	Female	General Surgery	Inpatient
P19	staff nurse	50-59	Female	Ophthalmology Surgical	Day case
P20	staff nurse	Up to 39	Female	Upper Gastrointestinal Surgical	Inpatient

Appendix 6.1

Multiphasic Environment Assessment Procedure (MEAP): Physical and Architectural Features (PAF) Checklist: Definitions of Domains

i) **Physical amenities:** Measures the presence of physical features which add convenience, attractiveness, and special comfort. (Is the main entrance sheltered from sun or rain? Are the halls decorated?)

ii) **Social recreational aids:** Assess the presence of features, which foster social behaviour and recreational activities. (is the lounge by the entry furnished for resting and casual conversation? Is there a pool or billiard table?)

iii) **Prosthetic aids:** Assess the extent to which the facility provides a barrier free environment as well as aids to physical independence and mobility. (Can one enter the building without having to use stairs? Are there handrails in the halls?)

iv) **Orientational aids:** Measures the extent to which the setting provides visual cues to orient the residents. (Is each floor colour coded or numbered? I s map with local resources marked on it available in a convenient public location?)

v) **Safety features:** Assess the extent to which the facility provides features for monitoring communal areas and for preventing accidents. (Is the outside walk and entrance visible from the office or station of an employee? Are there call buttons in the bathrooms?)

vi) **Architectural choice:** Reflects the flexibility of the physical environment and the extent to which it allows residents options in performing necessary functions. (Does each resident have access to both a bathtub and a shower? Are there individual heating controls?)

vii) **Space availability:** Measures the number and size of communal areas in relation to the number of residents, as well as size allowances for personal. (How many special activities areas are there? How large are these areas altogether? What size is the smallest per person?)

viii) **Staff facilities:** Assess the presence of facilities which aid staff and make it pleasant to maintain and manage the setting. (Are the offices free of distractions from adjacent activities? Is there a staff lounge?)

ix) **Community accessibility:** Measures the extent to which the community and its services are convenient and accessible to the facility. (Is there a grocery store within easy walking distance? Is there a public transportation stop within walking distance?)

Appendix 6.2

The Professional Environmental Assessment Procedure (PEAP): Definitions of Domains

i) **Maximize safety and security:** The extent to which the environment both minimizes threats to resident safety and security and maximizes sense of security of residents, staff, and family members.

ii) **Maximize awareness and orientation:** The extent to which users (often staff and visitors as well as residents) can effectively orient themselves to physical, social, and temporal dimensions of the environment.

iii) **Support functional abilities**: The extent to which the environment and the rules regarding the use of the environment support both the practice and continued use of everyday skills. These skills can be divided into activities of daily living (ambulation, grooming, bathing and toileting, eating, etc.) and independent activities of daily living, which will vary with stage of the disease.

iv) **Facilitation of social contact:** The extent to which the physical environment and rules governing its use support social contact and interaction among residents.

v) **Provision of privacy:** The extent to which input from (e.g., noise) and output to (e.g., confidential conversations) the larger environment are regulated.

vi) **Opportunities for personal control:** The extent to which the physical environment and the rules regarding the use of the environment provide residents with opportunities consistent with level of acuity, for exercise of personal preference, choice, and independent initiative to determine what they will do and when it is done.

vii) **Regulation and quality of stimulation:** People with dementia have decreased ability to deal with potentially conflicting stimuli and have greater difficulty distinguishing between fore-ground and background stimulation. Therefore, the environment must be sensitive to both the quality of stimulation and its regulation. The goal is stimulation without stress (two domains: ‘regulation’ and ‘quality’ have been combined in one for conciseness).

viii) **Continuity of the self.** The extent to which the environment and the rules regarding its use attempt to preserve continuity between present and past environments and the self of past and present. This can be expressed in two different ways: through presence of personal items belonging to the individual and by creation of a non-institutional ambiance.

Appendix 6.3

Therapeutic Environmental Screening Survey for Nursing Homes
INSTRUMENT MANUAL

DATE and TIME
Record the date and time of your observation. You should use the time that you begin your observation. If you plan to use the TESS-NH as a measure of comparison across sites keep the time standardized. Also, do not complete the TESS-NH during mealtimes, if possible.

UNIT DESCRIPTION
Many facilities have multiple special care units to serve populations with different needs. If there are four special care units within one facility you would complete the question as follows:

UNIT 1________________(unit) of 4____Total # of Units(units)

The goal of this question is to distinguish between multiple units.

Question A1. Type of unit:
There is tremendous diversity in what facilities consider Special Care Units (SCU), or in how they care for persons with dementia in non-SCUs. This question is designed to determine, on the most general level, what type of unit is being assessed.

A unit is defined as a geographically distinct area of a long-term care facility or a whole facility which contains spaces for sleeping and public use.

Special Care Unit (segregated): The segregated SCU must be physically separated from the rest of the facility by closed doors or the SCU is free-standing. Additionally, the facility/unit must self-designate the unit as a specialized dementia care unit. In addition to these two criteria, the unit must meet two of the three criteria described below:

1) The unit serves a population in which 75% or more of the residents have a diagnosis of Alzheimer's disease or related dementia.

2) The units programming and activities are dementia-specific.

3) The staff are trained in dementia care.

Special Care Unit (cluster): A distinct area (group of rooms) which is part of a larger, non-specialized unit. It must designate itself as a specialized dementia care wing, cluster, pod, etc. Additionally, it must meet criteria #1-3 explained in the SCU-segregated definition.

Non Special Care Dementia Unit: Any unit not meeting the definition of the segregated or cluster SCU, but serves at least 75% of persons with dementia. Ex. A separate (either segregated or cluster) unit for persons with dementia that doesn't provide dementia-specific programming and activities and/or doesn't provide staff training in dementia care.

Other Unit, Mixed or Unspecified: Choose this category if the unit or site does not meet the criteria for one of the three above. Examples: a hospital wing which serves 50% of persons with dementia and has some dementia programming. Or a long-term care setting which has mentally ill and dementia residents in a congregate living situation where some programming may be for persons with dementia. But, the unit is not dementia specific and the large majority of residents served are not demented.

Question A2. Resident rooms on unit:
Private rooms are rooms designed to accommodate one bed. Thus, the number of rooms *should* equal the total number of beds for this question. **Semiprivate rooms** are defined as rooms that were designed to accommodate two beds. Count the number of rooms and the number of beds (occupied and unoccupied). It is important to note that the number of beds may vary in double rooms. For example, a room may be designed for two beds, but is occupied by only one resident (and one bed). In this situation, you may need to ask staff.
Rooms that accommodate three or more beds should be counted and the number of beds should be totaled.

Question A3. Total rooms for unit: Add the number of rooms column of A2a, A2b, and A2c to calculate the total number fo resident rooms on the unit.

Resident Capacity should equal the total number of beds available.

The **number of residents sleeping on the unit today** will likely equal the total number of occupied beds. However, you will need to ask staff this question because residents may be out of the unit for medical or personal reasons.

PRIOR TO BEGINNING THE TESS-NH WALK-THROUGH

As you begin to make observations about the environment, begin listening for noises that may be disruptive and potentially impact the environment. The last environmental category (NOISES, questions 30 and 31) will ask you to judge noise level over the entire observational time frame. Pay particular attention to the kinds of noises you hear, their consistency and frequency. Similarly, identify the main television (if there is one) and watch throughout your observational period to determine if it is on continuously for a non-activity, if it is on for an activity, or if it is off during your entire observation.

Similarly, take note of odor of the unit when you first enter the SCU or study site. Question number 9 will ask about odors. Because persons accommodate to odor over time, your response to this question may not be accurate at a later time. In this case, first impressions are very important.

UNIT AUTONOMY

Question 1: Nurses Station

Issue: This question relates to the autonomy of the SCU in comparison with other units in the facility (if applicable). This question does not refer to non-nursing station work areas such as desks or observation posts.

A nursing station is an area where medical records and medication administration records (MARs) are kept. This area is primarily used as a work space for nurses and other staff. **Circle "2"** if the nursing station does not serve other units.
Circle "1" if the nursing station is shared with other units.
Circle "0" if there is no nursing station.

Question 2: Provision for Paperwork

Issue: This question relates to space available for unit staff to complete paperwork.
Nursing Station: see definition of question 1
Separate Desk in Public Area: There is a designated desk in the public area (that may or may not be in an alcove) that is used for staff paperwork. This desk is not used for programmed activities, but only for staff. If this desk contains medical records and MARs then it is defined a nursing station and would not be marked "yes".
Counter/Work Area Combined with Other Area: Designated as a staff work area where staff do most of their charting, but when staff are not using this area, it is used by residents for different activities.
Enclosed Work Room: A room that is enclosed by a door that staff use to do paperwork. However, this room does not contain medical records and MARs that would meet the definition of a nursing station. Ex. If there is an enclosed office for nursing staff and the office contains MARs and patient records, code yes for Nursing Station, but no for Enclosed Work Room.

Question 3: Unit Serves as Pathway

Issue: The goal of this question is to determine if there is increased traffic flow in the unit as a result of the unit's location within a larger facility. It is expected that such a pathway will interfere with the physical environment by making it louder and more difficult in terms of exit control. It may also interfere with a units autonomy. Similarly, such a pathway may have programmatic concerns including difficulty engaging residents in activities or increasing confusion among persons with dementia.

"Yes" if the unit has two doors in which staff and visitors use to go from one part of the facility to another.

"No" If the unit does not serve as a pathway because it only has one entrance/exit to the rest of the facility or if the unit is in no way attached to a larger facility (i.e. it is a house, it is physically separate from the rest of the facility, etc.)

Question 4: Ability to provide services to residents

Issue: The goal of this question is to assess the ability to provide services to its' residents without using other parts of the facility.

Circle the correct response for the number of persons who engage in the eating, formal activities, and bathing on the unit.

EXIT CONTROL

Question 5: Exit Disguise

Issue: The goal of this question is to determine what types of efforts have been made to disguise exits from residents. It refers to the location of the door and its ability to be recognized as a door.

"Yes" refers to the whole door and the door frame, and possibly (but not necessarily) the surrounding area being treated so that it does not look like a door. (This does not include just "painting out" the door the same color as the wall). It may also include the intentional design of the unit to put the door in a place that is not easily accessible to residents. The disguise must be deliberate.

"To Some Extent" indicates that at least part of the door is visible. Some attempts have been made to disguise the door. For example, painting the door and frame as the same color as the surrounding walls (only applicable if the rest of the doors in the facility are not treated the same way). It may also include a fabric barrier in front of the door handle.

"No" refers to no efforts to disguise exits in any way.

Question 6: Exit Monitoring

Issue: The purpose of this question is to assess how exiting the unit is monitored and controlled. Do not include exits that lead to secured courtyards; that question will be addressed later. Instead, consider all other possible exits from the unit. Circle "yes" to all responses that apply.

6a. Number of Exits off of the unit: Count the number of exits that leave the unit, excluding elevators and doors that lead to courtyards.

6b. Number of Elevators off of the unit: Count the number of elevators that can be used to exit the unit.

6c. Locked Doors: Doors are locked if they limit the residents' ability to physically leave the unit. Circle "yes" if the exit is permanently locked or if the lock can be disengaged by using some device such as a key, keypad, switch, etc.
If you circle "yes", answer questions 6d-6f.

6d. Triggered Locking Device: Resident wears a device (often a band around the wrist or ankle) that, when the resident approaches a door, the device triggers the door to lock. You may have to ask staff if this system is in place; it may not be directly obvious.

6e. Keypad or Switch: In order to unlock the door, one must press a sequence of numbers or letters on a keypad to disengage the lock. Or, the door may be unlocked by flipping a switch located somewhere on the unit (near the door, at the nursing station, etc.).

6f. Temporary Locks: There may be doors (excluding courtyard doors) that are unlocked during the daytime and/or good weather. However, the staff may lock them at night or when adverse weather conditions make it unsafe for residents to exit. Respond "yes" if this occurs on this unit. You may need to ask a staff person; this is usually not directly observable. When a lock is used only temporarily, it is not necessary to indicate the type of locking device is being used.

ALARMS:
An alarm is a sound that occurs that informs staff of unit exiting.

6g. Doors Alarmed: Are doors alarmed to monitor resident exit?
If you circle "yes", answer questions 6h-6j.

6h. Device Alarm: An alarm is sounded when a person wearing a device approaches an exit or walks through an exit. You may need to ask staff if this is not directly observable. If a resident approaches a door wearing such a device and the door locks and an alarm is sounded, you would code "yes" for 3b and 3h.

6i. Keypad Alarm: Code "yes" if the door is unlocked, and an alarm is sounded when persons exit the unit without disengaging the alarm by using a keypad or switch.

6j. Alarm with All Entries and Exits: No matter what you do, an alarm will sound when you enter or exit the unit. Remember to exclude courtyard exits.

MAINTENANCE

Question 7a-7d: Maintenance
Maintenance refers to loose handrails, broken door knobs, broken chairs, exposed wires or extension cords, wheelchairs with missing parts, etc.
Rate the maintenance of the following areas: shared social spaces, halls, residents' rooms, residents' bathrooms.

CLEANLINESS

Question 8a-8d: Cleanliness
Cleanliness refers to dirty walls or floors, spills which are not cleaned up, indoor litter, dust, etc. If a resident has just been bathed, there may be some water on the floor, but this should be cleaned up before another resident is brought in to be bathed. If the spilled water remains, you will code down. If the staff make an effort to clean the spills in a timely manner, you should not consider this "uncleanliness". Also, following mealtime, there may be food on the floor. This should be cleaned up within an hour following mealtime. Rate the cleanliness of the following spaces: shared social spaces, halls, residents' rooms, and residents' bathrooms.

Question 9a-9b: Unpleasant Odors
Issue: While recognizing that on most units there will be incontinent residents, staff are likely to quickly clean areas of the unit where these accidents occur. This question does not address odors which are localized by residents who have not yet been clean, but is concerned with odors in both public areas and residents' rooms. It is important to survey the entire unit (all public areas and most residents rooms) prior to responding to this question.

SAFETY

Question 10a-10d. Floor Surface
This question addresses the degree to which the surface is highly waxed and slippery, and whether the surface is uneven. Floor surfaces which are slippery are a hazard to the residents. Also, changes in floor material can be a problem if the surfaces are not level (i.e. if the carpet is higher than the tile floor, this rise could cause a foot to "catch" as one moves from the tile to the carpet). This question is for all areas of the unit, including the bathrooms.

Question 11: Handrails
Issue: Handrails assist residents in moving through the unit, and can aid in rising from the toilet. Do not count handrails in lounge/activity areas, as one would reasonably expect furniture to be around the walls in this type of space. Do not count bumper guards, as residents cannot easily hold onto them.

Rate hallways and bathrooms separately.

Question 11a. Hallways:
Extensive: if they are located on both sides of mosthalls.
Somewhat: if they are located on both sides of most halls or on one side of all halls.
Little or None: if handrails are largely absent.

Question 11b. Bathrooms:
Extensive: two handrails present on either side of the toilet to assist residents in sitting, standing, and turning. Handrails placed behind the toilets are not considered helpful and, thus, would not be counted aspresent.
Somewhat: there is one handrail placed on either side of the toilet to assist residents in sitting, standing and turning.
Little or None: handrails are absent or there is one handrail placed behind the toilet.

<u>LIGHTING</u>

Question 12: Light Intensity
Issue: Lighting is a critical environmental feature which supports a variety of functional activities. Because of age-related changes in eyesight, the older person needs almost three times as much light as a 20 year old. Also, he/she is very sensitive to changes in light levels and glare. Glare is usually a combination of light sources (either fixtures or sunlight) and floor surface (usually hard, shiny floors).

This question addresses the light level in three areas of the unit: hallways, activity areas, and resident rooms. You should consider intensity (glare and the evenness of the lighting will be addressed in Q13 and Q14). In order to judge the intensity of the lighting think of trying to read through the eyes of a 75 year oldperson.
You are asked to rate the light levels in three areas: hallways, activity areas, and residents rooms. For multiple activity rooms, and hallways consider the rating that would best represent most rooms.
*Turn on all of the available lights in the residents bedrooms before making an assessment of the lighting for the next three questions.

Ample: Bright, illuminated. Intensity of light makes it easy to read in all areas of the room.
Good: Lighting is basically good. It may be low in some areas. Reading would be easy in most areas of this room/hallway.
Barely Adequate/Inadequate: Light intensity is low. Reading is difficult or impossible in almost every area of thisroom.

Question 13: Glare
Issue: The older eye is especially sensitive to glare. This question addresses surfaces (particularly floors and walls, but also furniture surfaces) which are shiny and reflect light (sunlight or from light fixtures). Glare tends to vary depending on the day, whether it is sunny or not, and if there are many windows that allow sunlight into the unit.

A Little or None: there is little glare throughout the hallways, activity areas and resident rooms.
In a Few Areas: there are some surfaces which are shiny and reflect light.
In Many Areas: glare is present throughout the halls, activity areas and/or resident rooms.

Question 14: Even Lighting
Issue: In addition to intensity and glare, evenness of the light throughout the spaces is important. The older eye is especially sensitive to pools of light and dark. Lighting should be relatively even throughout the space, so that there is only moderate contrast between areas which are brighter and those which are less bright. *Remember to turn on the lights in the bedroom.

2: Lighting is even throughout theroom
1: Lighting is even throughout most of this room. There may be corner where the lighting is dim, creating a shadow.
0: Lighting is uneven throughout this room.

<u>SPACE AND SEATING</u>

Question 15: Chairs in Resident Rooms
Issue: Residents should have an opportunity to sit in their room without having to sit on the bed. Count the number of rooms with chairs and divide this number by the total number of rooms. If the room is a double room, two chairs should be provided to accommodate both individuals.

Question 16: Unit Spaces
Issue: The goal of this question is to determine the number and types of different spaces which are available to residents <u>on theunit</u>.

Type of Area:
The following definitions apply to the specific room types. Code “yes” if the unit has this type of space.

Multi-purpose room: This room is used for multiple purposes often for formal activities and dining. This type of room is common for smaller or renovated special care units in which one room is used for all group gatherings.
Activity room: This room is generally used for formal group activities. It may vary in size depending on the size of theunit.

Dining room: This room is used exclusively for meals and snacks.

Lounge: This room is generally used for informal activities. It tends to be smaller (more like a den or living room in your

home). Activities that might go on in a lounge include small family gatherings, television/video watching, small group gatherings, reading.
Some facilities call these rooms family rooms. It may also be a theme room for reminiscing.

Alcove: Any widening of a hallway used for public seating and or activities. If the widening occurs on one side only and if its depth is no more than the width of the hallway, then it is an alcove. If its depth exceeds the width of the hallway, then it is a room.

Other: If you have additional activity rooms, lounges, etc. use the 11f-11i and indicate the type of room. This question does not imply that the room must be some other type of room than has already beenlisted.

Exclusively for Unit: If access to the room/area is limited to the residents of the unit. If the unit of interest is part of a larger unit, only respond "yes" if the area is primarily for the unit residents, not the rest of theunit.

Seating Capacity: The count of available seating spaces within a given room. A chair would allow one person to sit at a time. A couch would often allow 2-3 persons to sit comfortably. Also, count empty spaces for wheelchairs (which require approximately 30" X 48"). Piano benches also constitute available sitting space.
Example: an activity room contains four tables with four chairs per table. It also has a loveseat and a chair. In addition, there is space for three additional wheelchairs to fit. Thus, seating would total (4x4) + 2 + 1+ 3 = 22. You would enter this number under seating category for the appropriate room.

Square Footage: In order to accurately measure the dimensions of a room, it is recommended that a digital estimator be used. These can be purchased from Brookstone
#Y-14395. The cost approximately $45. In order to get the square footage, you take the length of one side of a room (in feet) and multiply this number by the width (in feet) of the room.
If you are unable to purchase the digital distance estimator, you can "step off" the room. Many people have a step of approximately 3 feet. Or you can put one foot in front of another and walk across the room with each step approximately 1 foot.

Adjacent Toilet: This question assesses the availability and accessibility of bathrooms in public areas (if there is a public toilet for resident use available and in view adjacent to the different public areas). Respond yes if the doorway of the bathroom is no more than eight feet from the public room the rater is observing.

Question 17: Positive Wandering
Issue: This question addresses opportunities for positive wandering. The goal is to create a path which the resident can follow, which ideally provide the resident with a sense of going somewhere. Also, allows for opportunities to sit and rest while wandering.

Question 17a:
Dead Ends: is defined as an end of a path that requires the person to turn around in a space which is no wider than the path, or which leads to doors which the residents are not supposed to go through (doors with alarmed or secured doors). If a facility has both dead end paths and non-dead end paths, code for whichever is more prevalent.
ex. traditional nursing homes, with long halls that end with doors would be coded as "dead end". "L-shaped" halls can end in dead ends unless the end of the hall opens into another room or to an unlockedcourtyard.

No Dead Ends: means that either the paths lead directly into rooms or alcoves which are wider than the path, or that they lead directly to other paths (such as intersecting hallways).
ex. a circular pathway is not likely to lead to dead ends. A hallway which ends, but opens into an activity area would not be considered a dead end.

Question 17b:
Places to Sit: seating must be on the path or in an alcove, but not in a separate room or lounge.

No Places to Sit: no seating is provided along the wandering path

Question 18: Configuration of Rooms
Issue: This question relates to the ability of the unit to help orient the residents and guide them to public areas. Plans which are more open, allowing easy visual access to public areas are probably easier for residents (as opposed to residents having to read signs or locate hidden areas). For the purposes of this question, a hallway only counts as a "hallway" if it has walls on bothsides.

No Hallways: is the appropriate response if the majority of bedrooms open up onto the public areas.

Short Hallways: if bedrooms open up onto hallways which are approximately 40-50 feet making it somewhat difficult to see public areas from the bedroom doors. The hallway length is the length of 4 typical, side-by-side semi-private rooms.

Long Hallways: if the bedrooms open up to hallways that are more than 40-50 feet. Public spaces are not visible or are very difficult to see from most of the resident rooms.

If there are multiple hallways with different lengths, choose the one which is most prevalent.

FAMILIARITY/HOMELIKENESS

Question 19: Homelike Atmosphere
Issue: Increased familiarity and non-institutional image for the unit can be achieved in part through the types of furnishings and decorations used in the unit. Residential appearance is enhanced through the use of non-institutional finishes and furnishings: curtains, wallpaper, variety of furniture with texture, carpet or hard wood floors, lamps, wall-hangings, bookshelves, etc.

Public Areas: defined as any room/area which is not a bedroom, and not solely for staff use. i.e. activity areas, resident dining areas, hallways, lounges, common resident bathrooms.

"Homelike" furnishings: defined as a variety of different types of furniture (particularly chairs), pattern or visual texture in the fabric, use of fabric (may be plasticized) vs. vinyl or Naugahyde, wood or veneer vs. plastic or laminate. Having the same style chair throughout the dining room can be homelike, but this chair should not be in other areas throughout the unit. Arrangement of the furniture (set at right angles to each other as opposed to side by side) is also more residential.

"Other features": which related to a homelike environment include wall treatments (wall paper or border print as opposed to painted walls), floor treatment (not vinyl or terrazzo), window treatments (curtains), and lighting (lamps and incandescent fixtures as opposed to ceiling fluorescent fixtures).

Question 20: Kitchen Availability
Issue: A kitchen promotes familiarity and residential quality of the unit. This question is concerned with the availability of the kitchen components, not resident use of these components. Availability of kitchen components means there is an opportunity for use and addresses the physical environment. Use of the kitchen components would constitute a process measure; residents use of their physical environment.

2: a kitchen area is available and residents have access to its use. The kitchen should have the following four components of a residential kitchen: sink, cooking appliance (may include a stove or microwave), refrigerator, and counter space.
1: there are selected kitchen appliances available on the unit. For example, the unit has a refrigerator available for resident use, but the unit does not have a cooking appliance.
0: there are no kitchen appliances available on the unit and the residents never have access to any kitchen appliances.

Question 21: Personalizing Residents' Rooms
Issue: Personalization does more than just create a sense of personal space and territory. It helps people to maintain a sense of identity. In order for the room to be considered personalized, the room must have three personal pictures and/or momentos. The momentos must vary (three cards from a granddaughter do not constitute personalization). Additionally, the momentos and/or pictures must be placed in two different locations. Items that are not considered to be personal include staff generated cards and collages. The items should represent the individual and have meaning to the individual. Could include various family photographs, their trophy from a fishing tournament, quilts or bedspreads from home, knickknacks, etc. This does not include personal furniture since non-institutional furniture is addressed in a previous question.

Count the number of rooms that meet the definition of personalization and divide by total number of rooms in order to get the percentage.

Question 22: Non-Institutional Furniture
Issue: The presence of home-like, non-institutional furniture creates a more comfortable environment for individuals. For this question, furniture may include bed, bureau or dresser, wardrobe, table or chair. It is not essential that the furnishings actually be brought from the specific individual's home. What is important is that it looks home-like and the attempt is made by the family OR facility to create a non-institutional bedroom.

Question 23: Resident Appearance
Issue: Resident appearance may be a good indicator of the degree to which staff respect the residents and are supportive of their dignity. This measure of appearance reflects process of care. Similarly, resident appearance can add or takes away from the overall physical environment of the unit, thus reflecting a structural aspect of the special care unit.
You are to determine if the residents are well groomed and if their appearance is appropriate for the setting and time of day. Residents who are well groomed are clean, their hair is combed, and their hands/nails are clean. Residents may have on a range of clothing to meet their individual needs (sweatsuit or suit) and different styles of clothing would be expected on a unit. Residents may/may not have on shoes depending on the time of day. The most important things to remember is whether or not the resident appearance adds or takes away from the physical environment.

2: if 75% or more of the residents are well groomed
1: if 25-75% of the residents are well groomed
0: less than 25% of the residents are well groomed

VISUAL/TACTILE STIMULATION

Question 24: View of Courtyard
Issue: The goal of this question is to determine the extent and quality of views available to residents. The view which is most immediate and visible from windows should be considered. If there is a sizable courtyard or lawn, with a parking lot or brick wall on the far side, consider the view to be a courtyard. Consider courtyard view from bedrooms and public areas.

Definition of a Courtyard: A courtyard refers to outdoor spaces with natural green elements (grass, bushes, flowers etc.) and a view of the sky (the walls around the courtyard should not be taller than a one story building). An open vista refers to views of greater than 100 yards.

In order to determine the percentage of rooms with courtyard/vista views:

(1) count the number of rooms (bedrooms or public areas)

(2) count the number of rooms meeting the definition for the courtyard or vista view

(3) divide the number of total rooms by the number of rooms with a courtyard/vista view This should give you a percentage of the rooms with the courtyard/vista view. **Question**

Question 25a: Tactile Stimulation
Issue: People enjoy interacting with their environment often by picking up and carrying things around. This is especially true for the dementia population. An environment which provides ample opportunities for this may diminish residents desire to borrow things from other residents. Art on the walls which invites residents' touch is another opportunity for sensory stimulation and exploration.

Extensively: opportunities for tactile stimulation are in several program areas and in hallways
Quite a Bit: in at least one program area (but not several) and in hallways **Somewhat:** only in a specific program area or only in hallways, but not both **None:** nothing to pick-up or touch throughout the unit

Question 25b: Visual Stimulation
Issue: This question is designed to assess how much visual stimulation is provided throughout the unit. Examples of visual stimulation include pictures, wall hangings, display cases, patterned wallpaper. The objects of visual stimulation must be hung at eye level in order to be considered.

Extensively: opportunities for visual stimulation are in several program areas and in hallways
Quite a Bit: in at least one program area (but not several) and in hallways **Somewhat:** only in a specific program area or only in hallways, but not both **None:** nothing to look at or engage one's visual attention throughout the unit

ACCESS TO OUTDOORS

Question 26: Courtyard Accessibility
Issue: This question relates both to the accessibility of an outdoor space to the residents and to the autonomy which residents have in reference to its use.

"3": Residents have free access to a courtyard and the courtyard is adjacent to the unit. The door(s) is/are not secured by a lock. If the door is locked only at night or during inclement weather, the rater should still code "3."

"2": A courtyard is adjacent to the unit, but a staff (or family) member must accompany the resident outside, or must unsecure a door which leads to the outside area.

"1": A courtyard is available for resident use, but the courtyard is not adjacent to the unit. Thus, residents must be guided to the courtyard and accompanied by family or staff.

"0": There is no courtyard present.

Question 27: Courtyard Appearance and Functionality
Issue: Measuring the availability of a courtyard for resident use is important and necessary of an overall assessment of an SCU. It is equally important to measure the attractiveness (how inviting it is to use) and whether or not the courtyard is functional.

Question 27a:
Attractive: warm materials including wood and brick (not just white concrete walkways), comfortable seating, varied plantings, shade, a barrier that is visually appealing, bird feeders.

Question 27b:
Functional: seating available, walking paths, space for gardening, safe barrier (at least 8 feet or higher).

Very: If 75% or more of the above features are present. **Somewhat:** If 30-75% of the above features are present **Not at all:** If little or none of the above features are present

ORIENTATION/CUEING

Question 28: Cueing
Issue: This question refers to the units/facilities effort to help residents locate their bedrooms, their bathrooms, and public areas independently.

Questions 28a1-28g1: RESIDENT ROOMS:

a) "1" if the majority of the residents bedroom doors are left open during waking hours.

b) "1" if the residents name is on the door. The lettering must be at eye level and at least two inches high.

c) "1" if there is a current picture of the resident on or near the door(as he or she is now)

d) "1" if there is an old picture of the resident on or near the door(as he/she was years ago)

e) "1" if there are objects of personal significance on or near the door. Objects may include a photograph of a favorite pet or summer vacation spot. May also include a name badge he/she used to wear, arts/crafts that are meaningful to this person.

f) "1" if there are room numbers on or near the door that are at least two inches high and at eye level

g) "1" if the unit makes an effort to color code different rooms so that residents may identify their room. A hall with all the same color doors, is not individualized for the residents and would not count.

Questions 28a2-28c2: RESIDENT BATHROOMS:

a) "1" if the residents bathroom door is left open most of the time and the commode is visible from the resident's bed

b) "1" if the residents bathroom door is left open most of the time, but the commode is not visible from the resident's bed

c) "1" if the residents bathroom door is kept closed, but there is a picture, graphic or sign on the door to indicate the location of a bathroom.

Questions 28a3-28c3:
ACTIVITY AREA: any activity area available for residents to enter and provides opportunities for sitting and socializing (may include a nursing station)

a) "1" if the activity area is visible (you can see into it) from the doorway of at least 50% of the resident room doorways

b) "1" if a visual indicator such as an awning, statue, flag, or a nurses station (beside the most frequently used activity area) is visible from the doorway of at least 50% of the residents rooms. The goal of the visual indicator is to draw residents to the activity area

c) "1" if a directional sign (such as an arrow) or an identification sign (such as a name sign) for the activity room is visible from at least 50% of the resident room doorways.

PRIVACY

Question 29: Privacy in Resident Rooms
Issue: Privacy is an important human need which is often limited in institutions. This question addresses an individual's opportunities for privacy in his/her bedroom. If all rooms are private/non-shared, leave this question blank.

Privacy Curtain: A curtain is usually hung from the ceiling of the room and separates the beds from one another when pulled. If this is the only method used for privacy, code "1" for Privacy Curtain and "0" for other.

Other: Any other type of measure used to secure privacy. Other types of privacy measures include: solid partition such as a wardrobe, a movable wall barrier. Indicate in the space provided any means of providing privacy in shared rooms and circle "1" for "other".

NOISES

Question 30: Television
Issue: The television can be disturbing as background noise especially if the television is being used for non-activity purposes. Persons with dementia often cannot understand the programs, and as a result may increase confusion. This question should be rated based on your entire observation time-not only what is happening now.

2: The television was off all of the time.
1: The television was on some of the time for a non-activity. For example, the television was turned on to a channel which does/is not showing a program that is relevant to the individuals in the home. If the television was on all of the time, but was only briefly used for programming, code 1.
0: The television was on all of the time and was not being used for an activity. A major concern is that staff may turn on the television to suit their purposes, not the residents.
6: The television was on all of the time for an activity. The activity should be "age- appropriate" activity such as watching an old black and white movie. After the activity ended, the television was turned off.
9: No television present on the unit.

Question 31: Noise
Issue: The older person, and the person with dementia in particular, have a difficult time screening out background noise.

This skill is necessary to facilitate concentration on a task or conversation with someone. Additionally, loud and consistent background noises can be a source of frustration and confusion for residents residing on the unit.
Record noises you have heard throughout your entire observation period completing the TESS-NH.

Not at all: During your entire observation period you have heard no noises of this type.
Sometimes: During your entire observation period you heard this noise periodically. **Constantly or high intensity:** During your entire observation period you heard this noise constantly OR intermittently, but with highintensity.

OVERALL PHYSICAL ENVIRONMENT

Question 32. This question addresses your opinion of the overall physical environment. In making this decision consider all factors related to the physical environment that have already been answered previously. Circle a response 1-10.

Appendix 6.4

Sheffield Care Environment Assessment Matrix (SCEAM): Examples of Items used to Asses Domains

i) **Privacy:** No resident bedrooms passed by outsiders (e.g. people visiting manager, attending meetings). Bathroom / wc fittings not visible from corridor when door open. Bedroom doors lockable from inside.

ii) **Personalisation:** Shelving for personal items in dayroom. Emergency call points in bedroom allow for different room layouts. Space to personalise approaches to bedroom (e.g. doors in alcoves).

iii) **Choice and control:** Free access to garden/outside spaces. Choice of bath or shower. Resident control of bedroom heating.

iv) **Community:** On public transport route. Local services within ¼mile. Space for family gatherings e.g. small lounge, kitchenette.

v) **Safety and health:** Garden / outdoor spaces have safeguards against wandering. Whole dayroom visible from threshold. No unprotected heaters or exposed pipes in bathroom.

vi) **Support for physical frailty:** All outside spaces accessible without steps. No bedroom more than 15 m walk from dayroom (with lift journey if necessary). Shower facilities wheelchair users.

vii) **Comfort:** Observed temperature satisfactory. Observed light level satisfactory. Observed air quality satisfactory.

viii) **Support for cognitive frailty:** Direction of all public spaces clear from all bedroom thresholds. Bedroom doors recognisable by building element (e.g. staircase, window, recess). Ensuite wc visible from bed.

ix) **Awareness of outside world:** Weather-protected seating outside entrance. Corridors have view of outside or internal courtyard. Spatial vriations in temperature within living unit.

x) **Normalness and authenticity:** No intrusive safety / security devices. Domestic décor in bathrooms and wcs. Variety of natural materials.

xi) **Provision for staff:** Separate changing room. Smoke-free area for eating separately from residents. Common room with comfortable chairs.

Appendix 6.5

Evaluation of Older People's Living Environments (EVOLVE): Definitions of Domains

Universal needs:

i) **Personal realisation and choice:** The degree to which the building enables residents to engage in chosen activities and lifestyle. ***Example:*** *There are areas in the garden where residents can grow plants and vegetables.*

ii) **Dignity and privacy:** The degree to which the building enhances dignity and affords residents privacy. ***Example:*** *There is a WC, which can be accessed without going through a bedroom.*

iii) **Comfort and control:** The degree to which residents have control over temperature and ventilation. ***Example:*** *The room or radiator has an individual thermostatic temperature control.*

iv) **Personal care:** The degree to which the building enables residents to perform activities of personal care, such as washing and bathing. ***Example:*** *The bathroom has a shaver point.*

v) **Social support inside building:** The degree to which the building enables residents to socialise within the housing scheme. ***Example:*** *There is space in the lounge for a minimum of four people to sit down within a 3.5m diameter without rearranging furniture.*

vi) **Social contact outside:** The degree to which the building enables residents to socialise outside the housing scheme, through its design and location. ***Example:*** *scheme is located within a 400m travel distance of a public transport terminus such as a bus stop.*

Support for older age:

vii) **Accessibility:** The degree to which design features enable residents to move freely around the building without assistance. ***Example:*** *There is space inside the hallway for a wheelchair turning circle more than 1500mm.*

viii) **Physical support:** The degree to which design features enable physically frail residents to have independence. ***Example:*** *Handrails are provided along travel routes.*

ix) **Sensory support:** The degree to which the building ameliorates the effects of sensory impairments such as sight loss or hearing difficulties. ***Example:*** *The electric light illuminance is more than 200 lux.*

x) **Dementia support:** the degree to which the building supports the needs of residents with dementia. ***Example:*** *Public areas are indicated by their larger scale and higher ceilings.*

xi) **Health and safety:** The degree to which the building provides a safe environment, which promotes good health. ***Example:*** *The lounge has an alarm call.*

xii) **Security:** The degree to which the building provides a secure environment. ***Example:*** *The scheme front door has an entry phone system.*

xiii) **Working care:** The degree to which building enables staff to deliver the highest standard of care. ***Example:*** There is more than 600mm round the sides of the washbasin to allow a carer to be present.

Appendix 7.1

Table of Standard Maintained Illuminance

Standard Maintained Illuminance (lux)	Foot-candles	Characteristics of Activity	Representative Activity
50	5	**Interiors rarely used for visual tasks** *(no perception of detail)*	Cable tunnels, nighttime sidewalk, parking lots
100 - 150	10-15	**Interiors with minimal demand for visual acuity** *(limited perception of detail)*	Corridors, changing rooms, loading bay
200	20	**Interiors with low demand for visual acuity** *(some perception of detail)*	Foyers and entrances, dining rooms, warehouses, restrooms
300	30	**Interior with some demand for visual acuity** *(frequently occupied spaces)*	Libraries, sports and assembly halls, teaching spaces, lecture theaters
500	**50**	**Interior with moderate demand for visual acuity *(some low contrast, color judgment tasks)***	**Computer work, reading & writing, general offices, retail shops, kitchens**
750	75	**Interior with demand for good visual acuity** *(good color judgment, inviting interior)*	Drawing offices, chain stores, general electronics work
1000	100	**Interior with demand for superior visual acuity** *(accurate color judgment & low contrast)*	Detailed electronics assembly, drafting, cabinet making, supermarkets
1500 -2000+	150-200+	**Interior with demand for maximum visual acuity** *(low contrast, optical aids & local lighting will be of advantage)*	Hand tailoring, precision assembly, detailed drafting, assembly of minute mechanisms

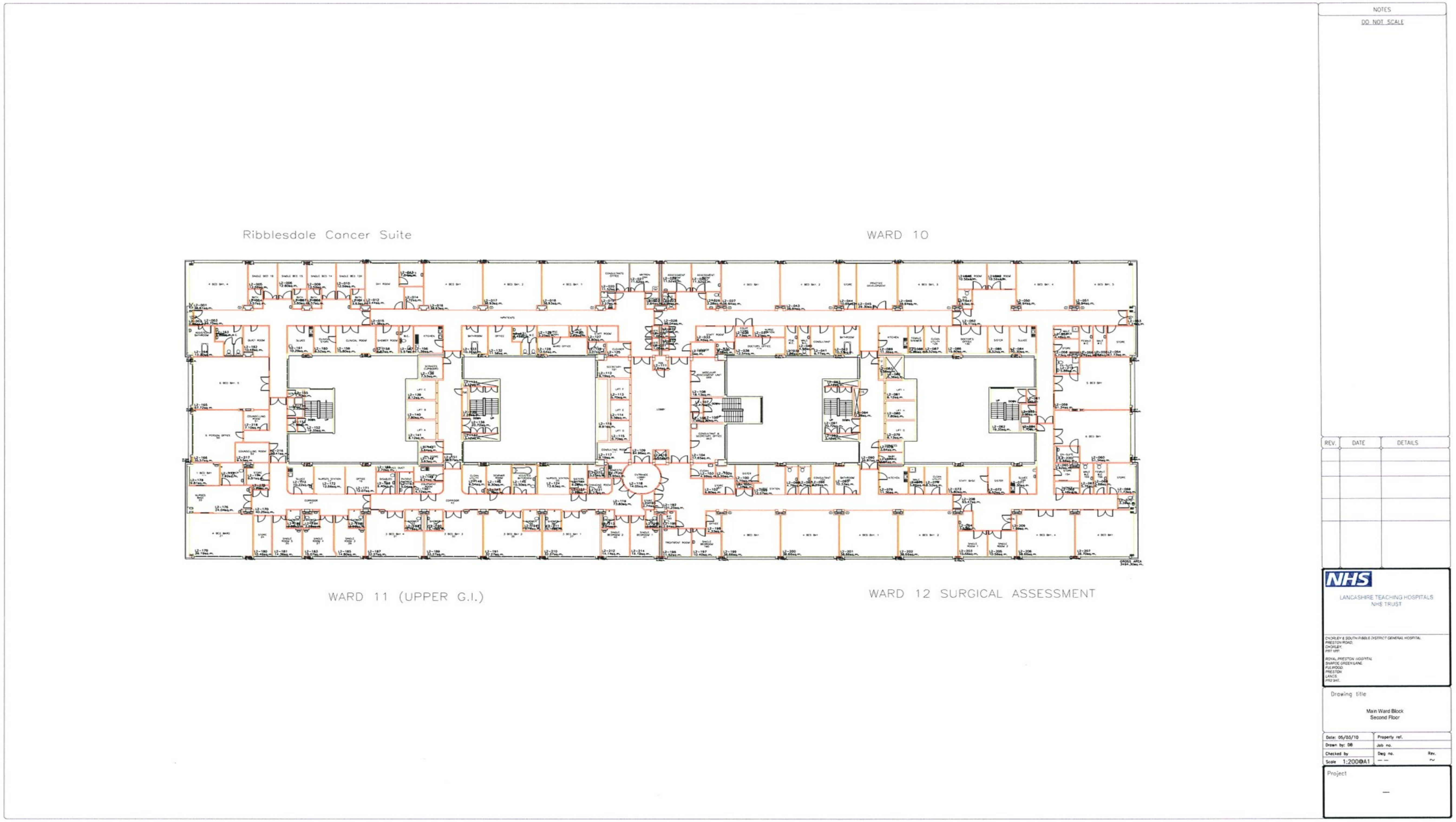
Source: Autodesk Education Community (2015)

http://sustainabilityworkshop.autodesk.com/buildings/measuring-light-levels

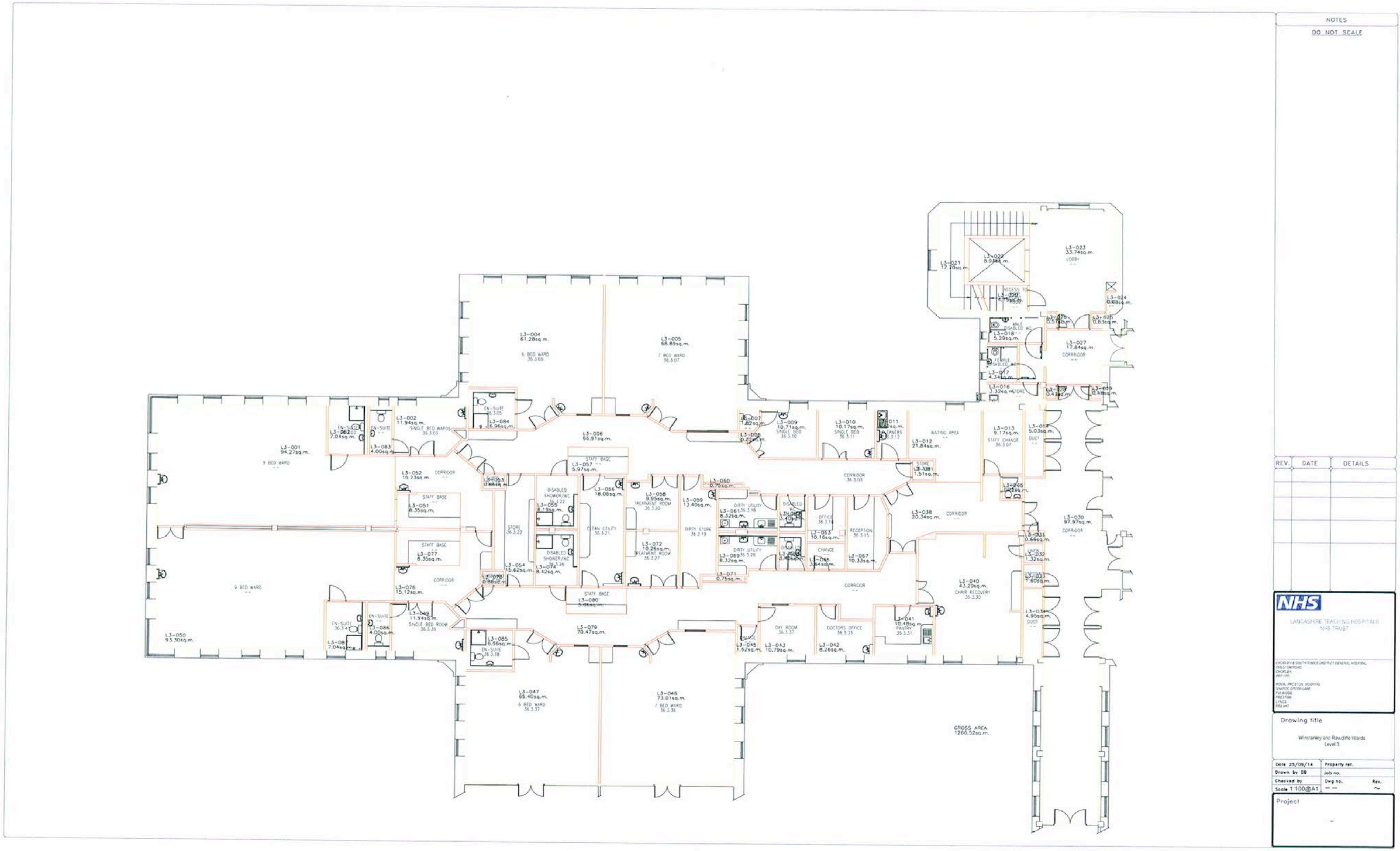
Autodesk Education Community. (2015). Measuring Light Levels Retrieved 23 January, 2016, from http://sustainabilityworkshop.autodesk.com/buildings/measuring-light-levels

Appendix 7.2

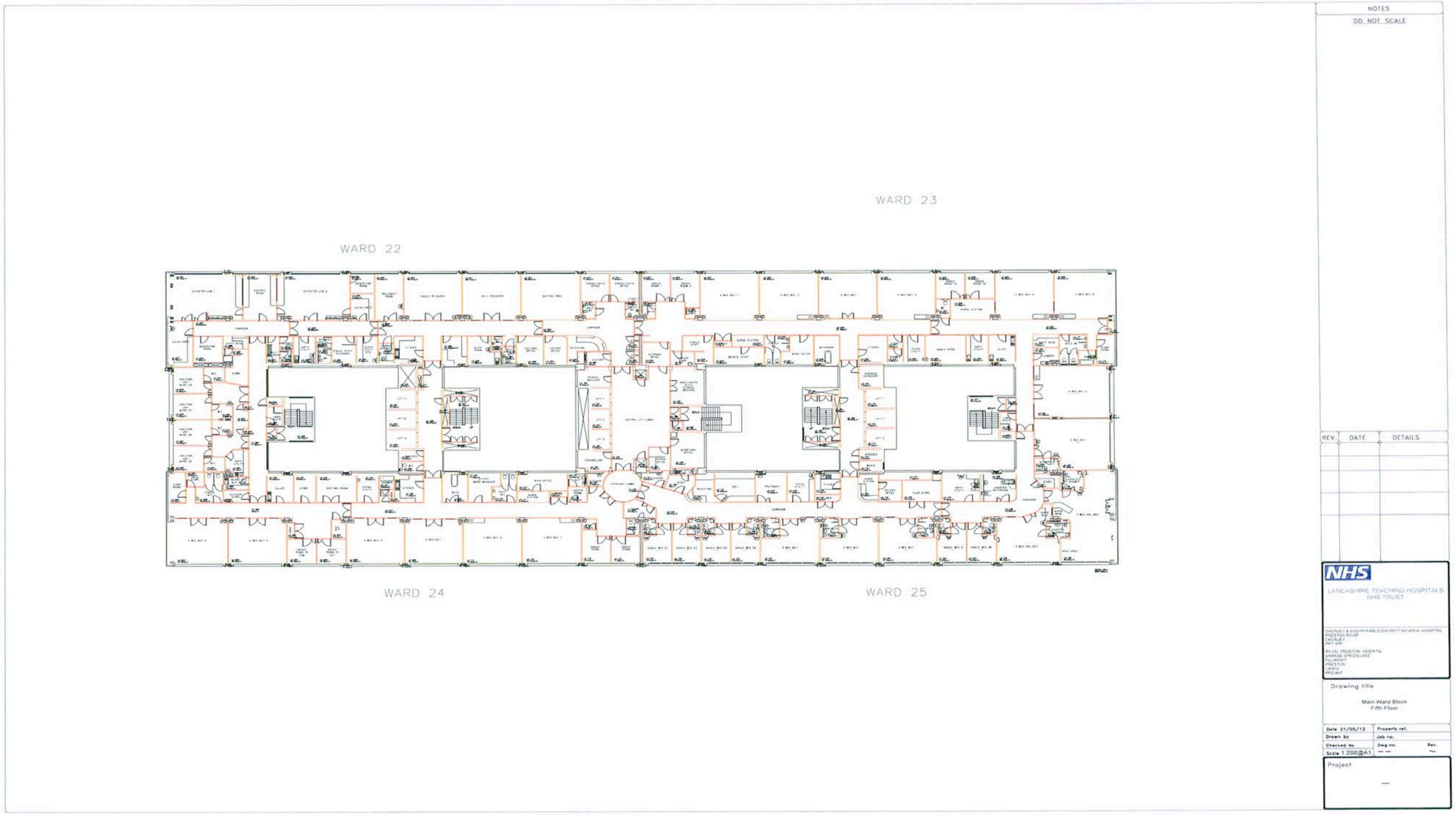
Ward A Layout



Ward B Layout



Ward C Layout



Appendix WA-WE01

Ward Environment Assessment Tool

Ward A – Nurse Station

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORES	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE01	nurse station	sensory	1		1	in case of more than one nurse station, each patient bay visible from at least one nurse station
	nurse station	sensory	2		1	if only one nurse station, farthest patient bay doorway visible from the nurse station
	nurse station	physical	3		1	staff kitchen not farther than 25 metres from the farthest nurse station
	nurse station	physical	4		1	staff WC separate from patients' and visitors' facilities
	nurse station	physical	5		0	staff WC offers gender choices
	nurse station	universal	6		1	at least two nursing computer workstations with ergonomic seating
	nurse station	universal	7		1	accommodates at least two further nursing staff sitting to facilitate team collaboration and short meetings
	nurse station	physical	8		0	desktop height adjustable
	nurse station	physical	9		1	if desktop height not adjustable, then desktop not more 75cm from floor finishing
	nurse station	universal	10		0	desktop surfaces covered with infection resistant finishing
	nurse station	universal	11		1	desktop with bar to conceal paperwork from visitors/outsiders
	nurse station	physical	12		1	computer keyboard separate from screen
	nurse station	physical	13		1	computer keyboard tilt to allow flexible keying positions for different users
	nurse station	sensory	14		1	computer keyboard characters clear and readable
	nurse station	sensory	15		1	computer keyboard free of glare and reflection
	nurse station	physical	16		1	computer mouse positioned close to user without need to stretch
	nurse station	universal	17		1	computer mouse allows flexibility in positions for multiple users (considers both left and right hand users)
	nurse station	physical	18		1	user's wrist and forearm can be supported on desktop
	nurse station	sensory	19		1	display screen clear and readable
	nurse station	sensory	20		1	display screen free of glare and reflection
	nurse station	physical	21		1	display screen swivel and tilt
	nurse station	sensory	22		1	if display screen placed facing a window, adjustable blinds installed
	nurse station	sensory	23		1	adjustable window blinds in working order
	nurse station	universal	24		1	desktop surface large enough for all equipment, papers, etc., considering multiple users
	nurse station	universal	25		1	desktop surface tidy, not overcrowded
	nurse station	physical	26		1	all equipment on desktop reachable by user, considering multiple user
	nurse station	universal	27		1	desktop offers rearrangement options for multiple users
	nurse station	sensory	28		1	desktop surfaces free from glare and reflection
	nurse station	universal	29		1	chairs suitable
	nurse station	physical	30		1	chairs stable
	nurse station	physical	31		1	chair seat has back height and tilt adjustments
	nurse station	physical	32		1	seat height adjustable
	nurse station	physical	33		1	chair glides for flexible positions
	nurse station	physical	34		1	small of the back supported by chair's backrest
	nurse station	physical	35		1	desk leg area allows free movement of legs

	nurse station	physical	36		1	desk leg area free of obstruction
	nurse station	physical	37		1	feet flat on the floor without undue pressure on user's backs of the leg
	nurse station	physical	38		1	forearms horizontal, at ease and comfortable
	nurse station	physical	39		1	screen display positioned so that user's eyes at roughly the same height as the top of the display screen
	nurse station	physical	40		1	user seated with straight back, supported by the chair
	nurse station	physical	41		1	user seated with relaxed shoulders
	nurse station	universal	42		1	chair adjusted correctly for current user
	nurse station	physical	43		1	workstation offers enough room to change position and vary movement
	nurse station	universal	44		1	workstation cables tidy, free of trip or snag hazards
	nurse station	universal	45		0	cupboards installed for basic nursing items (not medicines)
	nurse station	sensory	46		1	floor surface, slip-free and glare-free
	nurse station	universal	47		1	flooring adequately maintained
	nurse station	universal	48		1	floor and wall intersection coved to prevent dirt building up on floor corners
	nurse station	cognitive	49		0	tabard pinafore provided for medication rounds
	nurse station	cognitive	50		1	equipped with adequate stationeries and writing materials for note taking
	nurse station	cognitive	51		1	stores charts and notes for patient care-related documentation
	nurse station	cognitive	52		0	ward schedule planner/shift rota mounted on wall
	nurse station	sensory	53		0	acoustic insulation to reduce noise intrusion
	nurse station	sensory	54		1	all patient bays & side rooms visible from at least one nurse station
	nurse station	sensory	55		0	corridor wall glazed to enhance visibility to patient bays
	nurse station	sensory	56		0	glaze demarcation to enhance confidential telephone conversation
	nurse station	sensory	57		0	if no glaze demarcation, appropriate sound insulation facilitates confidential telephone conversation
	nurse station	sensory	58		0	natural daylight adequate without use of artificial lighting (ample, no glare)
	nurse station	sensory	59		0	ambient lighting fitted on desktop
	nurse station	universal	60		1	temperature satisfactory
	nurse station	sensory	61		1	sound level satisfactory
	nurse station	universal	62		0	natural air ventilation through window
	nurse station	universal	63		1	air quality satisfactory (not stuffy or draughty)
	nurse station	universal	64		1	observed air movement
	nurse station	sensory	65		1	absence of unpleasant smell
	nurse station	sensory	66		1	absence of conflicting sounds
	nurse station	physical	67		0	access door/barrier fitted, not open access
	nurse station	physical	68		1	threshold avoided
		two-third rule:	75.56%	79.41%	54	

Appendix WA-WE02

Ward Environment Assessment Tool

Ward A – Patient Bay

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE02	patient bay	universal	1		1	separate male/female bays
	patient bay	physical	2		0	clear bed space at least 3.6 m wide and 3.7 m deep for each bed
	patient bay	physical	3		0	at least 1.5m around each side of the length of patient bed
	patient bay	physical	4		0	at least 1.3m at the leg end of each patient bed
	patient bay	physical	5		1	emergency buzzer installed and accessible near each patient bed, without moving bed
	patient bay	physical	6		1	for multi-occupancy room, minimum room width 4.5m to allow wheeling a second bed without disturbing the first
	patient bay	physical	7		1	distance from the closest nurse station not more than 30m
	patient bay	cognitive	8		1	the farthest patient bay doorway visible from at least one nurse station
	patient bay	cognitive	9		1	day room doorway visible from patient bay threshold
	patient bay	physical	10		1	plastic or wooden strip fitted on walls at 400-700mm height above floor level, to prevent damage by movement of beds
	patient bay	physical	11		1	night table installed next to each bed
	patient bay	physical	12		1	night table can be accessed without moving bed
	patient bay	physical	13		1	cupboard installed for patient personal belongings
	patient bay	physical	14		1	cupboard can be opened without moving bed
	patient bay	physical	15		0	cupboard fitted with lockable valuables section
	patient bay	physical	16		0	suitcase locker on top of cupboard
	patient bay	physical	17		1	cupboard hinges allow cupboard doors to open at least 135 degree
	patient bay	physical	18		1	lockable staff cupboard for basic nursing materials, not medicines (zero, if not lockable)
	patient bay	physical	19		1	room door at least 1260 x 2130mm
	patient bay	physical	20		0	room door fitted with sound insulation
	patient bay	physical	21		1	door closing mechanism overhead
	patient bay	physical	22		1	service supply duct runs behind the beds
	patient bay	physical	23		1	oxygen supply outlet within reach of each bed, without moving beds
	patient bay	physical	24		0	vacuum line installed in duct
	patient bay	physical	25		1	compressed air sockets within reach of each bed, without moving beds
	patient bay	physical	26		1	extra power points, unused, for movable equipment
	patient bay	physical	27		1	power points for patient use fitted, within reach of each bed, without moving beds
	patient bay	physical	28		0	reading lights for patient use installed, within reach of each bed, without moving beds
	patient bay	physical	29		0	emergency buzzer installed, within reach of each bed without moving beds
	patient bay	physical	30		1	all power cables and outlets are housed in the duct
	patient bay	physical	31		1	washbasin installed
	patient bay	physical	32		1	wc installed
	patient bay	physical	33		1	washbasin not more than 860mm from floor, to allow access by wheelchair users
	patient bay	physical	34		1	adequate leg space underneath washbasin to enhance access by wheelchair users
	patient bay	physical	35		1	wc seat height not more than 490mm

	patient bay	universal	36		1	en suite accessible shower or bathroom installed
	patient bay	physical	37		1	en suite door accessible by wheelchair users
	patient bay	physical	38		1	en suite door accessible by independent patients using mobility devices, e.g. walking frames
	patient bay	universal	39		0	a table (900 x 900mm for four patients) installed with a chair for each patient
	patient bay	physical	40		1	patient bed height adjustable electronically
	patient bay	physical	41		1	no trailing cords, wires or tubes
	patient bay	universal	42		1	rooms not overlooked by pedestrian route closer than 22m
	patient bay	physical	43		1	floor surface, seamless, slip-free and glare-free
	patient bay	physical	44		1	flooring adequately maintained
	patient bay	physical	45		1	floor and wall intersection coved to prevent dirt building up on floor corners
	patient bay	sensory	46		1	view of nurse station from at least one patient bed
	patient bay	cognitive	47		0	view of corridor activities (within ward) from all patient beds
	patient bay	sensory	48		1	natural daylight adequate without use of artificial lighting
	patient bay	sensory	49		1	light level satisfactory (ample, no glare)
	patient bay	cognitive	50		1	dark at night, or alternative blind mechanism installed
	patient bay	sensory	51		0	reading lights for patient use installed, within reach of each bed, controllable by patient, without moving beds
	patient bay	universal	52		1	temperature satisfactory
	patient bay	sensory	53		1	sound level satisfactory
	patient bay	sensory	54		1	window installed, glazed
	patient bay	sensory	55		1	air quality satisfactory (not stuffy or draughty)
	patient bay	sensory	56		1	natural air ventilation through window
	patient bay	universal	57		1	observed air movement
	patient bay	sensory	58		1	absence of unpleasant smell
	patient bay	cognitive	59		1	absence of conflicting sounds
	patient bay	cognitive	60		1	call system not disturbing at night
	patient bay	cognitive	61		1	patient bay door signage
	patient bay	cognitive	62		1	view of outside human activities from all patient beds
	patient bay	sensory	63		1	day room doorway visible from patient bay threshold
	patient bay	physical	64		1	accessible door fitted
	patient bay	cognitive	65		0	accessible doors fitted with signage to facilitate space identification and wayfinding
	patient bay	physical	66		1	accessible doors fitted with a door handle
	patient bay	physical	67		1	accessible doors fitted with an extra pull handle
	patient bay	sensory	68		1	accessible doors fitted with glazing a window
	patient bay	physical	69		1	accessible doors fitted with a kick plate
	patient bay	physical	70		1	kick plates between 0.30m and 0.40m in height
	patient bay	physical	71		0	door handles are lever-type handles, push plates or pull handles on swinging doors
	patient bay	physical	72		1	door handles located at a comfortable height between 0.90m and 1.00m from the floor surface
	patient bay	physical	73		1	round knobs are avoided
	patient bay	physical	74		1	doors with spring closers equipped with an extra pull handle approximately 0.30m in length
	patient bay	physical	75		1	doors with spring closers have extra pull handle mounted between 0.90m and 1.20m from the floor
	patient bay	physical	76		0	accessible door permits operation by one person, in a single motion, with one hand and with little effort
	patient bay	physical	77		1	for double-leaf doors, at least one leaf has a minimum clear width of 0.80m

	patient bay	physical	78		1	threshold avoided
	patient bay	cognitive	79		0	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	patient bay	cognitive	80		0	room numbers placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	patient bay	cognitive	81		1	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
	patient bay	cognitive	82		0	glazed doors clearly marked with a coloured band or mark placed at a height between 1.40m and 1.60m
		two-third rule:	94.25%	78.05%	64	

Appendix WA-WE03

Ward Environment Assessment Tool

Ward A – Side Room

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE03	side room	universal	1		1	at least two side rooms provided
	side room	universal	2		1	no shared side rooms
	side room	physical	3		1	distance from the closest nurse station not more than 20m
	side room	universal	4		0	minimum room size 20.0m square
	side room	universal	5		0	patient control of ventilation: window or air conditioning can be operated by wheelchair or bed-confined persons (zero if shared)
	side room	universal	6		1	patient control of lighting, other than main switch by door (zero if shared)
	side room	universal	7		0	chairs not wipe clean or plastic fabric
	side room	universal	8		1	en suite bathroom installed
	side room	universal	9		1	en suite wc installed
	side room	universal	10		1	en suite washbasin installed
	side room	universal	11		0	adequate clothes storage provided
	side room	physical	12		1	emergency access to en suite: door opens out to avoid fallen patient becoming trapped
	side room	physical	13		0	emergency release of lock of en suite door from inside room, e.g. with key or coin
	side room	universal	14		1	emergency buzzer installed
	side room	universal	15		1	provision of TV in room
	side room	universal	16		1	layout allows sitting space for visitors
	side room	physical	17		1	clear bed space at least 3.6 m wide and 3.7 m deep
	side room	physical	18		1	at least 1.5m space for wheelchair manoeuvre
	side room	physical	19		1	at least 1.5m around each side of the length of patient bed
	side room	physical	20		0	at least 1.3m at the leg end of each patient bed
	side room	physical	21		1	patient bed height adjustable electronically
	side room	physical	22		1	wheelchair access to opening side of en suite door: min. 30cm wall width
	side room	physical	23		1	space for nursing staff at each side of fittings in en suite
	side room	physical	24		0	padded backrest on en suite wc
	side room	physical	25		1	ergonomic fittings in en suite (flush is lever, large and smooth to hold; taps cross-top or lever)
	side room	sensory	26		1	en suite bathroom with means of removing smell (extractor or window)
	side room	physical	27		1	en suite bathroom/wc fulfils accessible requirements under bathroom and wc
	side room	universal	28		0	en suite bathroom/wc with shaver point
	side room	physical	29		0	no trailing cords, wires or tubes

	side room	physical	30		1	secure handrail by washbasin and wc if provided
	side room	physical	31		1	no clash of room and en suite doors
	side room	universal	32		1	soap dispenser and hand dryer/paper towel
	side room	universal	33		1	no unprotected heater or exposed hot pipes
	side room	universal	34		0	plastic or wooden strip fitted on walls at 400-700mm height above floor level, to prevent damage by movement of beds
	side room	universal	35		0	emergency buzzer allows for different room layouts without trailing cords
	side room	universal	36		0	lockable storage space
	side room	physical	37		1	floor surface, seamless, slip-free and glare-free
	side room	universal	38		1	flooring adequately maintained
	side room	universal	39		1	floor and wall intersection coved to prevent dirt building up on floor corners
	side room	sensory	40		1	day room doorway visible from side room threshold
	side room	sensory	41		1	at least one nurse station visible from side room threshold
	side room	cognitive	42		1	side room door glazed with blind and on-looking corridor or circulation area
	side room	cognitive	43		0	view of activities within building but outside day room from patient bed (e.g. view of circulation space through glazed door window)
	side room	cognitive	44		1	view of corridor activities (within ward) from patient bed
	side room	cognitive	45		1	view of outside human activities (e.g.. roads, shops)
	side room	cognitive	46		1	view of natural landscape or garden
	side room	sensory	47		1	dark at night, or alternative blind mechanism installed
	side room	sensory	48		1	natural daylight adequate without use of artificial lighting
	side room	sensory	49		1	light level satisfactory (ample, no glare)
	side room	sensory	50		0	reading lights for patient use installed, within reach of each bed, controllable by patient, without moving beds
	side room	universal	51		0	patient control of heating (zero if shared)
	side room	universal	52		1	stable heating in room
	side room	universal	53		1	temperature satisfactory
	side room	sensory	54		1	sound level satisfactory
	side room	sensory	55		1	window installed, glazed
	side room	sensory	56		1	natural air ventilation through window
	side room	universal	57		1	air quality satisfactory (not stuffy or draughty)
	side room	universal	58		1	observed air movement
	side room	sensory	59		1	absence of unpleasant smell
	side room	cognitive	60		0	absence of conflicting sound sources
	side room	cognitive	61		0	absence of distressing sounds
	side room	sensory	62		1	acoustic privacy (zero if room shared)
	side room	cognitive	63		1	call system not disturbing at night
	side room	physical	64		1	entrance door accessible
	side room	universal	65		0	entrance door lockable from inside
	side room	cognitive	66		1	accessible door fitted with signage to facilitate space identification and wayfinding
	side room	physical	67		1	accessible door fitted with a door handle
	side room	physical	68		0	accessible door fitted with an extra pull handle
	side room	sensory	69		1	accessible door fitted with a glazed window
	side room	physical	70		1	accessible doors fitted with a kick plate
	side room	physical	71		1	kick plates between 0.30m and 0.40m in height
	side room	physical	72		1	door handles are lever-type handles, push plates or pull handles on swinging doors
	side room	physical	73		1	door handles located at a comfortable height between 0.90m and 1.00m from the floor surface

	side room	physical	74		1	round knobs are avoided
	side room	physical	75		1	accessible doors permits operation by one person, in a single motion, with one hand and with little effort
	side room	physical	76		1	the minimum opening is at least 0.80m when the door is open
	side room	physical	77		1	for double-leaf doors, at least one leaf has a minimum clear width of 0.80m
	side room	physical	78		1	threshold avoided
	side room	universal	79		1	en suite door opens out with at least 1.2m clear space to avoid fallen patient becoming trapped
	side room	universal	80		1	emergency release of lock of en suite door from inside room, e.g. with key or coin
	side room	cognitive	81		0	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	side room	cognitive	82		0	room number placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	side room	cognitive	83		0	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
	side room	cognitive	84		0	glazed door clearly marked with a coloured band or mark placed at a height between 1.40m and 1.60m
		two-third rule:	93.33%	72.62%	61	

Appendix WA-WE04

Ward Environment Assessment Tool

Ward A – Staff Room

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE04	staff room	universal	1		1	staff room provided
	staff room	universal	2		1	away from patient bays to facilitate recreation and complete disconnection from ward activities
	staff room	universal	3		0	separate staff bath/shower
	staff room	universal	4		1	separate staff wc
	staff room	universal	5		1	changing room provided
	staff room	universal	6		0	changing room offer gender choices
	staff room	universal	7		0	lockable lockers for each member of staff
	staff room	universal	8		0	dining table for at least one-third of staffing level
	staff room	universal	9		0	dining chairs for at least one-third of staffing level
	staff room	universal	10		0	smoke-free area for eating separately from smokers
	staff room	physical	11		1	floor carpeted, seamless, slip-free and glare-free
	staff room	universal	12		1	flooring adequately maintained
	staff room	universal	13		1	floor and wall intersection coved to prevent dirt building up on floor corners
	staff room	universal	14		0	staff room with comfortable chairs for one-third number of staffing level
	staff room	sensory	15		1	natural daylight adequate without use of artificial lighting (ample, no glare)
	staff room	universal	16		1	temperature satisfactory
	staff room	sensory	17		1	sound level satisfactory
	staff room	sensory	18		1	natural air ventilation through window
	staff room	universal	19		1	air quality satisfactory (not stuffy or draughty)
	staff room	sensory	20		1	absence of unpleasant smell
	staff room	universal	21		1	observed air movement
	staff room	cognitive	22		1	absence of conflicting sounds
	staff room	universal	23		1	access door passcode protected

	staff room	cognitive	24		1	access door fitted with signage to facilitate space identification and wayfinding
	staff room	physical	25		0	access door fitted with a door handle
	staff room	physical	26		0	access door fitted with an extra pull handle
	staff room	physical	27		1	access door fitted with a kick plate
	staff room	physical	28		1	kick plates between 0.30m and 0.40m in height
	staff room	physical	29		0	access door with spring closers equipped with an extra pull handle approximately 0.30m in length
	staff room	physical	30		0	access door with spring closers have extra pull handle mounted between 0.90m and 1.20m from the floor
	staff room	physical	31		1	access door permit operation by one person, in a single motion, with one hand and with little effort
	staff room	physical	32		1	the minimum opening is at least 0.80m when the door is open
	staff room	physical	33		1	threshold avoided
	staff room	cognitive	34		1	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	staff room	cognitive	35		0	room numbers placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	staff room	cognitive	36		1	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	87.80%	66.67%	24	

Appendix WA-WE05

Ward Environment Assessment Tool

Ward A – Ward Manager's Office

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE05	ward manager's office	universal	1		1	separate ward manager's office provided
	ward manager's office	universal	2		0	accommodates at least four other people seated for short meetings
	ward manager's office	physical	3		1	floor carpeted, seamless, slip-free and glare-free
	ward manager's office	universal	4		1	flooring adequately maintained
	ward manager's office	universal	5		1	floor and wall intersection coved to prevent dirt building up on floor corners
	ward manager's office	cognitive	6		1	telephone installed for quick contact with nurse station or other multidisciplinary team members
	ward manager's office	cognitive	7		1	stationery and writing materials for note taking
	ward manager's office	cognitive	8		0	acoustic insulation to reduce noise intrusion
	ward manager's office	universal	9		1	natural air ventilation through window
	ward manager's office	sensory	10		0	natural daylight adequate without use of artificial lighting (ample, no glare)
	ward manager's office	sensory	11		0	ambient lighting fitted on desktop
	ward manager's office	sensory	12		0	temperature satisfactory
	ward manager's office	sensory	13		0	sound level satisfactory

	ward manager's office	universal	14		1	air quality satisfactory (not stuffy or draughty)
	ward manager's office	sensory	15		1	observed air movement
	ward manager's office	sensory	16		1	absent of unpleasant smell
	ward manager's office	sensory	17		0	absent of conflicting sounds
	ward manager's office	physical	18		1	access door fitted, not open access
	ward manager's office	universal	19		1	access door lockable from outside or passcode protected
	ward manager's office	physical	20		1	access door lockable from inside
	ward manager's office	physical	21		1	access door fitted with signage to facilitate space identification and wayfinding
	ward manager's office	physical	22		1	access door fitted with a door handle
	ward manager's office	physical	23		0	access door fitted with an extra pull handle
	ward manager's office	sensory	24		1	access door fitted with a glazed window
	ward manager's office	physical	25		1	access door fitted with a kick plate
	ward manager's office	physical	26		1	access door kick plates between 0.30m and 0.40m in height
	ward manager's office	physical	27		1	access door handles are lever-type handles, push plates or pull handles on swinging doors
	ward manager's office	physical	28		1	access door handles located at a comfortable height between 0.90m and 1.00m from the floor surface
	ward manager's office	physical	29		1	round knobs are avoided
	ward manager's office	physical	30		1	access door permits operation by one person, in a single motion, with one hand and with little effort
	ward manager's office	physical	31		1	access door minimum opening is at least 0.80m when the door is open
	ward manager's office	physical	32		1	threshold avoided
	ward manager's office	cognitive	33		0	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	ward manager's office	cognitive	34		0	room numbers placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	ward manager's office	cognitive	35		1	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	89.74%	71.43%	25	

Appendix WA-WE06

Ward Environment Assessment Tool

Ward A – Doctor's Office

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE06	doctor's office	universal	1		1	separate doctor's office provided

	doctor's office	universal	2		1	accommodates at least four other people seated for short meetings
	doctor's office	physical	3		1	floor carpeted, seamless, slip-free and glare-free
	doctor's office	universal	4		1	flooring adequately maintained
	doctor's office	physical	5		1	floor and wall intersection curved to prevent dirt building up on floor corners
	doctor's office	universal	6		1	telephone installed for quick contact with nurse station or other multidisciplinary team members
	doctor's office	cognitive	7		1	stationery and writing materials for note taking
	doctor's office	cognitive	8		0	acoustic insulation to reduce noise intrusion
	doctor's office	sensory	9		0	natural air ventilation through window
	doctor's office	sensory	10		0	natural daylight adequate without use of artificial lighting (ample, no glare)
	doctor's office	sensory	11		0	ambient lighting fitted on desktop
	doctor's office	universal	12		1	temperature satisfactory
	doctor's office	sensory	13		1	sound level satisfactory
	doctor's office	universal	14		1	air quality satisfactory (not stuffy or draughty)
	doctor's office	universal	15		1	observed air movement
	doctor's office	sensory	16		1	absent of unpleasant smell
	doctor's office	cognitive	17		0	absence of conflicting sounds
	doctor's office	sensory	18		1	access door lockable from outside or passcode protected
	doctor's office	universal	19		1	access door lockable from inside
	doctor's office	cognitive	20		1	access door fitted with signage to facilitate space identification and wayfinding
	doctor's office	physical	21		1	access door fitted with a door handle
	doctor's office	physical	22		0	access door fitted with an extra pull handle
	doctor's office	physical	23		1	access door fitted with a kick plate
	doctor's office	physical	24		1	access door kick plates between 0.30m and 0.40m in height
	doctor's office	physical	25		1	access door handles are lever-type handles, push plates or pull handles on swinging doors
	doctor's office	physical	26		1	access door handles located at a comfortable height between 0.90m and 1.00m from the floor surface
	doctor's office	physical	27		1	round knobs are avoided
	doctor's office	physical	28		1	access door permits operation by one person, in a single motion, with one hand and with little effort
	doctor's office	physical	29		1	access door minimum opening is at least 0.80m when the door is open
	doctor's office	physical	30		1	threshold avoided
	doctor's office	cognitive	31		0	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	doctor's office	cognitive	32		0	room numbers placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	doctor's office	cognitive	33		0	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	89.19%	72.73%	24	

Appendix WA-WE07

Ward Environment Assessment Tool

Ward A – Day Room

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE07	day room	universal	1		1	day room provided
	day room	universal	2		1	room not through passageway to other parts of ward area
	day room	universal	3		1	external windows secured against intrusion
	day room	universal	4		1	windows with blinds for privacy, e.g.. for patient-family discussions
	day room	universal	5		0	room large enough for family gatherings
	day room	universal	6		1	TV installed for patient use
	day room	universal	7		1	choice of location for daytime activities
	day room	universal	8		0	adequate space for special support seating: at least two groups of patient-family discussions can take place simultaneously
	day room	universal	9		1	floor carpeted, slip-free and glare-free
	day room	universal	10		1	flooring adequately maintained
	day room	universal	11		1	floor and wall intersection coved to prevent dirt building up on floor corners
	day room	physical	12		1	at least 1.3m turning space for wheelchair
	day room	universal	13		1	various styles of chairs and settees
	day room	universal	14		0	chairs not wipe clean or plastic fabric
	day room	physical	15		0	tables or writing desks accessible by wheelchair users
	day room	universal	16		1	no unprotected heaters or exposed hot pipes
	day room	physical	17		1	doorway accessible by wheelchair users
	day room	physical	18		1	doorway accessible by independent patients using mobility devices, e.g. walking frames
	day room	cognitive	19		0	design is homelike, emulates domestic environment
	day room	cognitive	20		1	dayroom recognisable by its function
	day room	cognitive	21		1	signage on door to aid patient wayfinding
	day room	cognitive	22		0	signage in room to aid patient orientation
	day room	sensory	23		1	glazed window in access door to day room
	day room	sensory	24		1	doorway or room traffic visible from at least one nursing station
	day room	universal	25		0	room equipped with small lamps for individual activities (e.g. reading)
	day room	sensory	26		0	acoustic privacy, e.g. sound absorbent surfaces
	day room	universal	27		1	natural air ventilation through window
	day room	sensory	28		1	natural daylight adequate without use of artificial lighting (ample, no glare)
	day room	sensory	29		1	light level satisfactory (ample, no glare)
	day room	universal	30		1	temperature satisfactory
	day room	sensory	31		1	sound level satisfactory
	day room	universal	32		1	no wc door immediately opposite day room
	day room	universal	33		1	air quality satisfactory (not stuffy or draughty)
	day room	universal	34		1	observed air movement
	day room	sensory	35		1	absence of unpleasant smell
	day room	cognitive	36		1	absence of conflicting sound sources
	day room	universal	37		1	call system not disturbing at night

	day room	cognitive	38		0	maximum windowsill height 600mm
	day room	cognitive	39		0	view of outside human activities (e.g.. roads, shops)
	day room	cognitive	40		0	view of natural landscape or garden
	day room	cognitive	41		1	view of activities within building but outside day room (e.g.. view of circulation spaces through internal window)
	day room	universal	42		0	variation in temperature within room
	day room	cognitive	43		1	access door fitted with signage to facilitate space identification and wayfinding
	day room	physical	44		1	access door fitted with a door handle
	day room	physical	45		0	access door fitted with an extra pull handle
	day room	sensory	46		1	access door fitted with a glazed window
	day room	physical	47		1	access door fitted with a kick plate
	day room	physical	48		1	access door kick plates between 0.30m and 0.40m in height
	day room	physical	49		1	access door handles are lever-type handles, push plates or pull handles on swinging doors
	day room	physical	50		1	access door handles located at a comfortable height between 0.90m and 1.00m from the floor surface
	day room	physical	51		0	round knobs are avoided
	day room	physical	52		1	access door permits operation by one person, in a single motion, with one hand and with little effort
	day room	physical	53		1	access door minimum opening is at least 0.80m when the door is open
	day room	physical	54		1	threshold avoided
	day room	cognitive	55		0	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	day room	cognitive	56		0	room numbers placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	day room	cognitive	57		0	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	93.44%	70.18%	40	

Appendix WA-WE08

Ward Environment Assessment Tool

Ward A – Corridor

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE08	corridor	cognitive	1		1	corridor traffic visible from at least one nursing station
	corridor	universal	2		1	entrance area welcoming to visitors: reception and signposting
	corridor	universal	3		1	safeguards against unwanted visitors (e.g. staffed reception area)
	corridor	sensory	4		1	offers direct visual path between main entrance and reception or to at least one nurse station
	corridor	cognitive	5		1	signage to aid wayfinding and orientation
	corridor	cognitive	6		0	noticeboard with information for visitors
	corridor	cognitive	7		0	colour-coding to aid spatial differentiation of ward elements opening from corridor
	corridor	cognitive	8		0	external reference views visible from corridor (visible landmarks that assist indoor orientation, e.g. roads, buildings)
	corridor	universal	9		0	emergency buzzer points at intervals of 10m throughout corridors
	corridor	universal	10		1	unrestricted access for ambulant and independent patients
	corridor	physical	11		1	unrestricted through access by wheelchair users
	corridor	physical	12		1	unrestricted through access by ambulant patients using mobility devices (e.g. zimmer frames)
	corridor	cognitive	13		1	all patient-accessible spaces easy to supervise by nursing staff

	corridor	physical	14		1	all patient-accessible spaces easy to access
	corridor	universal	15		0	staff photographs on display
	corridor	physical	16		1	public telephone facilities at suitable heights for wheelchair users
	corridor	physical	17		0	at least 2.5m wide for patient transport on beds and trolleys
	corridor	physical	18		0	effective width not constricted by projections, columns, or other building elements
	corridor	physical	19		0	suspended corridor ceiling not less than 2.4m high
	corridor	physical	20		1	to facilitate use by ambulant disabled and elderly people, handrails mounted between 0.85m and 0.95m above the finished floor level
	corridor	physical	21		0	for the benefit of wheelchair users, a second handrail mounted between 0.70m and 0.75m from the finished floor level
	corridor	physical	22		1	handrails continue uninterrupted (except for doorways) on both sides of the corridor
	corridor	physical	23		1	for wall-mounted handrails, the space between the handrail and the wall should be between 40mm and 50mm for smooth walls and 60mm for rough textured walls
	corridor	physical	24		1	handrails have no snag ends
	corridor	physical	25		1	floor surfaces, seamless, non-slip and even
	corridor	physical	26		1	flooring securely fastened
	corridor	physical	27		1	no thresholds or steps on corridors
	corridor	universal	28		1	floor and wall intersection coved to prevent dirt building up on floor corners
	corridor	physical	29		1	all ward spaces accessible from corridor without steps
	corridor	physical	30		1	all ward spaces accessible with zero gradient, or slope not more than 1.3 degree
	corridor	universal	31		0	resting area on routes from patient bays to day room
	corridor	universal	32		1	no unprotected heaters or exposed hot pipes
	corridor	universal	33		0	plastic or wooden strip fitted on walls at 400-700mm height above floor level, to prevent damage by movement of beds
	corridor	physical	34		1	at least one patient wc accessible from corridor by wheelchair users
	corridor	physical	35		0	at least one visitor wc accessible from corridor by wheelchair users
	corridor	physical	36		0	door handles are lever with return
	corridor	physical	37		0	door closers to day room, bathroom, wc, are hold-open or free-swing
	corridor	cognitive	38		0	visual contrast between fittings (handrails, door handles, switches) and background
	corridor	universal	39		1	no barriers e.g. fire doors, without hold-open
	corridor	physical	40		1	no other observed barriers
	corridor	cognitive	41		1	absence of distracting or confusing background noise from medical equipment
	corridor	cognitive	42		0	corridor has view of outside human activities (e.g.. roads, shops)
	corridor	sensory	43		0	corridor has exterior window or other form of natural light
	corridor	sensory	44		0	windows for lighting and ventilation not further than 8m apart
	corridor	sensory	45		0	adequate natural light
	corridor	sensory	46		0	light level satisfactory (ample, no glare)
	corridor	universal	47		1	temperature satisfactory
	corridor	sensory	48		1	sound level satisfactory
	corridor	sensory	49		1	air quality satisfactory (not stuffy or draughty)
	corridor	universal	50		1	observed air movement
	corridor	sensory	51		1	absence of unpleasant smell
	corridor	cognitive	52		1	absence of conflicting other sounds
	corridor	cognitive	53		1	call system not disturbing at night
	corridor	sensory	54		1	patient accessible telephone
	corridor	sensory	55		0	intentionally brighter lighting at corners and transitions

		two-third rule:	96.49%	61.82%	34	

Appendix WA-WE09

Ward Environment Assessment Tool

Ward A – Corridor

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE09	storage room	universal	1		0	space for wheelchairs equivalent to number of patient beds
	storage room	universal	2		0	space to store at least one mobile hoist
	storage room	universal	3		0	space to store mobility devices (e.g.. zimmer frames)
	storage room	universal	4		1	space to store linens and supplies
	storage room	sensory	5		0	natural daylight adequate without use of artificial lighting (ample, no glare)
	storage room	universal	6		1	temperature satisfactory
	storage room	sensory	7		1	sound level satisfactory
	storage room	universal	8		1	air ventilator or window installed
	storage room	universal	9		1	air quality satisfactory (not stuffy or draughty)
	storage room	universal	10		1	observed air movement
	storage room	sensory	11		1	absence of unpleasant smell
	storage room	cognitive	12		1	absence of conflicting sounds
	storage room	cognitive	13		0	item spaces colour-coded for easy identification
	storage room	cognitive	14		0	access door fitted with signage to facilitate space identification and wayfinding
	storage room	physical	15		0	access door fitted with a door handle
	storage room	physical	16		0	access door fitted with an extra pull handle
	storage room	sensory	17		0	access door fitted with a glazed window
	storage room	physical	18		1	access door fitted with a kick plate
	storage room	physical	19		1	access door kick plates between 0.30m and 0.40m in height
	storage room	physical	20		0	access door with spring closers equipped with an extra pull handle approximately 0.30m in length
	storage room	physical	21		0	access door with spring closer has extra pull handle mounted between 0.90m and 1.20m from the floor
	storage room	physical	22		1	access door permits operation by one person, in a single motion, with one hand and with little effort
	storage room	physical	23		1	access door minimum opening is at least 0.80m when the door is open
	storage room	physical	24		1	threshold avoided
	storage room	cognitive	25		0	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	storage room	cognitive	26		0	room numbers placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	storage room	cognitive	27		1	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	81.82%	51.85%	14	

Appendix WA-WE10

Ward Environment Assessment Tool

Ward A – Clean Utility

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE10	clean utility	universal	1		1	hand wash basin installed
	clean utility	universal	2		1	soap dispenser and hand towels facilities installed
	clean utility	universal	3		1	pharmacy return skip installed
	clean utility	universal	4		1	segregated waste disposal skips installed
	clean utility	universal	5		1	separate skip for medical wastes (syringes and cannulas and waste medicines)
	clean utility	cognitive	6		1	at least 120 x 60 cm worktop for medicine preparation, calculation and related documentation
	clean utility	universal	7		1	worktop surfaces covered with infection resistant finishing
	clean utility	sensory	8		1	worktop surfaces free of glare and reflection
	clean utility	cognitive	9		1	medicine cabinets labelled
	clean utility	cognitive	10		0	medicine cabinets colour coded
	clean utility	universal	11		1	disposable gloves provided
	clean utility	physical	12		1	floor surface, slip-free and glare-free
	clean utility	universal	13		1	flooring adequately maintained
	clean utility	universal	14		0	floor and wall intersection curved to prevent dirt building up on floor corners
	clean utility	physical	15		1	sufficient floor space to accommodate at least two members of staff
	clean utility	cognitive	16		0	network computer provided for quick access to medicines and pharmaceutical instructions
	clean utility	cognitive	17		0	telephone installed for quick contact with nurse station or to consult other multidisciplinary team members
	clean utility	cognitive	18		1	stationery and writing materials for note taking
	clean utility	cognitive	19		0	acoustic insulation to reduce noise intrusion
	clean utility	sensory	20		0	natural daylight adequate without use of artificial lighting (ample, no glare)
	clean utility	sensory	21		0	ambient lighting fitted for worktop
	clean utility	universal	22		1	temperature satisfactory
	clean utility	sensory	23		0	sound level satisfactory
	clean utility	sensory	24		1	air quality satisfactory (not stuffy or draughty)
	clean utility	sensory	25		1	observed air movement
	clean utility	sensory	26		1	absence of unpleasant smell
	clean utility	cognitive	27		1	absence of conflicting sounds
	clean utility	physical	28		1	access door passcode protected
	clean utility	cognitive	29		0	access door with turn on/off signage to indicate medication calculation in progress
	clean utility	physical	30		1	access door with spring closes without extra effort
	clean utility	cognitive	31		1	access door fitted with signage to facilitate space identification and wayfinding
	clean utility	physical	32		0	access door fitted with a door handle
	clean utility	physical	33		0	access door fitted with an extra pull handle
	clean utility	sensory	34		1	access door fitted with a glazed window with blind mechanism
	clean utility	physical	35		1	access door fitted with a kick plate
	clean utility	physical	36		1	access door kick plates between 0.30m and 0.40m in height
	clean utility	physical	37		0	access door with spring closers equipped with an extra pull handle approximately 0.30m in length
	clean utility	physical	38		0	access door with spring closer has extra pull handle

						mounted between 0.90m and 1.20m from the floor
	clean utility	physical	39		1	access door permits operation by one person, in a single motion, with one hand and with little effort
	clean utility	physical	40		1	access door minimum opening is at least 0.80m when the door is open
	clean utility	physical	41		1	threshold avoided
	clean utility	cognitive	42		0	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	clean utility	cognitive	43		0	room numbers placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	clean utility	cognitive	44		0	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	90%	63.64%	28	

Appendix WA-WE11

Ward Environment Assessment Tool

Ward A – Sluice

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE11	sluice	physical	1		1	sluice not more than 30m from the farthest patient room
	sluice	universal	2		1	sluice walls tiled or covered with infection resistant finishing
	sluice	sensory	3		1	means of removing smell (extractor or window) from sluice
	sluice	universal	4		1	different types of waste adequately segregated by skip type and/or colour coded
	sluice	sensory	5		1	waste containers/skips fitted with lids to prevent odours escaping
	sluice	sensory	6		1	access door lockable from outside or passcode protected
	sluice	sensory	7		1	access door spring closes automatically to prevent odour escaping
	sluice	cognitive	8		1	access door fitted with signage to facilitate space identification and wayfinding
	sluice	physical	9		0	access door fitted with a door handle
	sluice	physical	10		0	access door fitted with an extra pull handle
	sluice	sensory	11		0	access door fitted with a glazed window
	sluice	physical	12		1	access door fitted with a kick plate
	sluice	physical	13		1	access door kick plates between 0.30m and 0.40m in height
	sluice	physical	14		1	access door permits operation by one person, in a single motion, with one hand and with little effort
	sluice	physical	15		1	access door minimum opening at least 0.80m when the door is open
	sluice	physical	16		1	threshold avoided
	sluice	cognitive	17		0	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	sluice	cognitive	18		0	room number placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	sluice	cognitive	19		1	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	86.36%	73.68%	14	

Appendix WA-WE12

Ward Environment Assessment Tool

Ward A – Bathroom & WC

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE12	bathroom & wc	universal	1		1	medical fittings are discreet in bathrooms and wcs
	bathroom & wc	physical	2		1	at least one wc has enough space for a patient and the carer inside with door shut
	bathroom & wc	universal	3		1	no grouped wc separated only by partition
	bathroom & wc	physical	4		1	bathroom contains a wc (not commode)
	bathroom & wc	physical	5		1	wheelchair accessible bathroom & wc
	bathroom & wc	physical	6		1	wc at least 1.5m by 1.5m to allow parallel approach of wheelchair to wc
	bathroom & wc	physical	7		1	wc allows at least 1.5m in diameter for full 360 degree manoeuvring of wheelchair
	bathroom & wc	universal	8		0	storage/display space for personal items
	bathroom & wc	universal	9		1	access door lockable from inside
	bathroom & wc	universal	10		0	bathroom/wc with fittings (bath, wc, washbasins) not visible from open door
	bathroom & wc	universal	11		0	visual privacy within bathroom from nursing staff, e.g. alcove or screen
	bathroom & wc	universal	12		1	emergency access: door opens out with at least 1.2m clear space to avoid fallen patient becoming trapped
	bathroom & wc	universal	13		1	emergency release of lock from outside, e.g. with key or coin
	bathroom & wc	universal	14		1	emergency buzzer installed
	bathroom & wc	universal	15		0	separate visitor wc on corridor/circulating areas
	bathroom & wc	physical	16		1	a handle placed on the door from the inside to facilitate closing
	bathroom & wc	physical	17		0	another handle placed on door outside
	bathroom & wc	physical	18		1	for double-leaf doors, at least one leaf has a minimum clear width of 0.80m
	bathroom & wc	physical	19		1	operational devices on doors, such as handles, pulls, latches and locks, easy to grasp with one hand
	bathroom & wc	physical	20		1	handrails installed in wc, bathtub and shower to assist disabled persons to use the facilities safely and easily
	bathroom & wc	physical	21		1	handrails have a diameter of 30mm to 40mm
	bathroom & wc	physical	22		1	handrails firmly fixed with stand loads and have non-slip surfaces
	bathroom & wc	physical	23		0	mirrors suitable for use by both standing and seated persons
	bathroom & wc	sensory	24		0	bottom edge of mirrors located at a maximum height of 1.00m from the finished floor level
	bathroom & wc	physical	25		1	single-lever mixing-type taps or push-buttons taps easily operable by hand or elbow
	bathroom & wc	physical	26		1	clearance between the grip of the tap and any adjacent vertical surface not less than 35mm
	bathroom & wc	universal	27		0	telephone fixtures with a cord at least 1.50m long are installed
	bathroom & wc	physical	28		1	no doorsteps installed
	bathroom & wc	physical	29		1	no slope, except for drainage
	bathroom & wc	physical	30		1	threshold avoided
	bathroom & wc	physical	31		1	flooring materials slip-proof
	bathroom & wc	physical	32		1	flooring materials easy to clean
	bathroom & wc	physical	33		1	floor well-drained and provided with adequate waterproofing
	bathroom & wc	physical	34		1	pipes fitted in the wall
	bathroom & wc	universal	35		1	choice of bath or shower

	bathroom & wc	physical	36		1	at least one bathroom with equipment for assisted bathing
	bathroom & wc	physical	37		1	at least one bathtub with integral sitting area at non-tap end
	bathroom & wc	physical	38		0	height of the bathtub between 0.45 m and 0.50 m from finished floor level
	bathroom & wc	physical	39		1	at least one bathroom with shower for wheelchair access
	bathroom & wc	physical	40		1	drain openings in shower is placed in a corner of the stall so that slip-resistant rubber mats can be used
	bathroom & wc	physical	41		0	shower dimensions are at least 2.4m by 1.5m and allow 1.5m diameter for full 360 degree manoeuvring of wheelchair
	bathroom & wc	physical	42		1	floor of the shower stall not more than 20mm below the level of the surrounding floor area
	bathroom & wc	physical	43		1	shower stall with a beveled threshold not exceeding 13mm above the finished floor
	bathroom & wc	physical	44		1	shower seat conveniently positioned for the shower head at a height between 0.45m and 0.50m
	bathroom & wc	physical	45		1	toilet seats, bidets, shower seats and bath-tub seat mounted at the same height of the wheelchair seat, i.e. between 0.45m and 0.50 m above floor level.
	bathroom & wc	physical	46		1	handrail placed on the wall opposite the shower seat and mounted at a height between 0.85m and 0.95m
	bathroom & wc	physical	47		1	wheelchair access to opening size of door: min 30cm wall width
	bathroom & wc	physical	48		1	at least 1.3m turning space for wheelchairs in bathrooms
	bathroom & wc	physical	49		1	fittings accessible by carer from each side
	bathroom & wc	physical	50		1	secure handrails to bath, wc, and washbasin, mounted at a height between 0.85 m and 0.95 m.
	bathroom & wc	physical	51		0	padded backrest on wc
	bathroom & wc	sensory	52		1	visual contrast between fittings and background
	bathroom & wc	physical	53		1	ergonomic fittings to bath, washbasins & wc (e.g. flush is lever, large & smooth to hold; taps are cross-top or lever)
	bathroom & wc	universal	54		0	bathroom has shaver point
	bathroom & wc	universal	55		1	all accessories, such as soap, towel, hand dryer and toilet paper dispensers are provided
	bathroom & wc	physical	56		0	all accessories, such as soap, towel, hand dryer and toilet paper dispensers are placed at a height between 0.50 m and 1.20 m from the finished floor level
	bathroom & wc	universal	57		0	at least one accessible urinal provided
	bathroom & wc	physical	58		0	lower edge of mirrors positioned at a height not exceeding 1.00m
	bathroom & wc	sensory	59		1	means of removing smell (extractor or window) in wc and bathroom with wcs
		two-third rule:	84.29%	74.58%	44	

Appendix WA-WE13

Ward Environment Assessment Tool

Ward A – Kitchen

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE13	kitchen	universal	1		0	annexed to nurse station
	kitchen	universal	2		1	if not annexed to nurse station, not farther than 25m metres from the farthest nurse stations
	kitchen	physical	3		0	at least 140 cm by 60cm clear worktop space for meal preparation
	kitchen	universal	4		0	vending machine for snacks, cold drinks
	kitchen	universal	5		1	microwave for meal heating
	kitchen	universal	6		1	refrigerator for cold meal storage
	kitchen	universal	7		1	water heating device to make hot drinks
	kitchen	universal	8		1	tea making machine provided
	kitchen	universal	9		1	coffee making machine provided

	kitchen	sensory	10		0	kitchen worktop free of glare and reflection
	kitchen	cognitive	11		0	acoustic insulation to reduce noise intrusion
	kitchen	sensory	12		0	natural daylight adequate without use of artificial lighting (ample, no glare)
	kitchen	sensory	13		0	ambient lighting fitted for worktop
	kitchen	universal	14		1	temperature satisfactory
	kitchen	sensory	15		0	sound level satisfactory
	kitchen	universal	16		1	air quality satisfactory (not stuffy or draughty)
	kitchen	universal	17		0	observed air movement
	kitchen	sensory	18		1	absence of unpleasant smell
	kitchen	cognitive	19		1	absence of conflicting sounds
	kitchen	universal	20		1	if not annexed to nurse station, access door lockable from outside or passcode protected
	kitchen	physical	21		1	access door spring closes automatically to prevent odour escaping
	kitchen	physical	22		1	access door fitted with signage to facilitate space identification and wayfinding
	kitchen	physical	23		0	access door fitted with a door handle
	kitchen	physical	24		0	access door fitted with an extra pull handle
	kitchen	sensory	25		1	access door fitted with a glazed window
	kitchen	physical	26		0	access door fitted with a kick plate
	kitchen	physical	27		1	access door permits operation by one person, in a single motion, with one hand and with little effort
	kitchen	physical	28		1	access door minimum opening at least 0.80m when the door is open
	kitchen	physical	29		1	threshold avoided
	kitchen	cognitive	30		1	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	kitchen	cognitive	31		0	room number placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	kitchen	cognitive	32		0	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	88.89%	56.25%	18	

Appendix WA-WE14

Ward Environment Assessment Tool

Ward A – Entrance & Exit

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
	entrances & exits	sensory	1		0	at least one entrance or exit visible from at least one nursing station
	entrances & exits	physical	2		1	no threshold
	entrances & exits	physical	3		1	kick plates between 0.30m and 0.40m in height
	entrances & exits	physical	4		1	doorway accessible by ambulant and independent patients
	entrances & exits	physical	5		1	doorway accessible by wheelchair users
WE14	entrances & exits	physical	6		1	door accessible by ambulant patients using mobility devices (e.g. zimmer frames)
	entrances & exits	sensory	7		1	swinging doors on corridors have glazed low windows to enable users to see oncoming traffic
	entrances & exits	sensory	8		0	glazed doors clearly marked with a coloured band or mark placed at a height between 1.40m and 1.60m
	entrances & exits	sensory	9		1	bottom edge of the window on swinging corridor doors not higher than 1.00m from the finished floor level
	entrances & exits	cognitive	10		1	colour of the entrance door contrasts with the surrounding surface, to be distinguishable by people with sight problems

	entrances & exits	physical	11		1	round knobs are avoided
	entrances & exits	physical	12		1	doors with spring closers equipped with an extra pull handle approximately 0.30m in length
	entrances & exits	physical	13		0	doors with spring closers have extra pull handle located between 0.20m and 0.30m from the hinged side of door
	entrances & exits	physical	14		1	doors with spring closers have extra pull handle mounted between 0.90m and 1.20m from the floor
	entrances & exits	physical	15		1	pivoted doors swing away from the direction of travel
	entrances & exits	physical	16		1	accessible doors have the following features: a sign, a door handle, an extra pull handle, glazing and a kick plate
	entrances & exits	physical	17		1	entrance & exit doors permits operation by one person, in a single motion, with one hand and with little effort
	entrances & exits	physical	18		1	vestibules avoided between two sets of doors
	entrances & exits	cognitive	19		1	signage to facilitate wayfinding
	entrances & exits	cognitive	20		1	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	66.67%	85.00%	17	

Appendix WB-WE01

Ward Environment Assessment Tool

Ward B – Nurses Station

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE01	nurse station	sensory	1		1	in case of more than one nurse station, each patient bay visible from at least one nurse station
	nurse station	physical	2		0	staff kitchen not farther than 25 metres from the farthest nurse station
	nurse station	physical	3		1	staff wc separate from patients' and visitors' facilities
	nurse station	physical	4		0	staff wc offers gender choices
	nurse station	universal	5		1	at least two nursing computer workstations with ergonomic seating
	nurse station	universal	6		1	accommodates at least two further nursing staff sitting to facilitate team collaboration and short meetings
	nurse station	physical	7		0	desktop height adjustable
	nurse station	physical	8		1	if desktop height not adjustable, then desktop not more 75cm from floor finishing
	nurse station	universal	9		0	desktop surfaces covered with infection resistant finishing
	nurse station	universal	10		1	desktop with bar to conceal paperwork from visitors/outsiders
	nurse station	physical	11		1	computer keyboard separate from screen
	nurse station	physical	12		1	computer keyboard tilt to allow flexible keying positions for different users
	nurse station	sensory	13		1	computer keyboard characters clear and readable
	nurse station	sensory	14		1	computer keyboard free of glare and reflection
	nurse station	physical	15		1	computer mouse positioned close to user without need to stretch
	nurse station	universal	16		1	computer mouse allows flexibility in positions for multiple users (considers both left and right hand users)
	nurse station	physical	17		1	user's wrist and forearm can be supported on desktop
	nurse station	sensory	18		1	display screen clear and readable
	nurse station	sensory	19		1	display screen free of glare and reflection
	nurse station	physical	20		1	display screen swivel and tilt
	nurse station	universal	21		1	desktop surface large enough for all equipment, papers, etc., considering multiple users
	nurse station	universal	22		0	desktop surface tidy, not overcrowded
	nurse station	physical	23		1	all equipment on desktop reachable by user, considering multiple user

	nurse station	universal	24		1	desktop offers rearrangement options for multiple users
	nurse station	sensory	25		1	desktop surfaces free from glare and reflection
	nurse station	universal	26		1	chairs suitable
	nurse station	physical	27		1	chairs stable
	nurse station	physical	28		1	chair seat has back height and tilt adjustments
	nurse station	physical	29		1	seat height adjustable
	nurse station	physical	30		0	chair glides for flexible positions
	nurse station	physical	31		1	small of the back supported by chair's backrest
	nurse station	physical	32		1	desk leg area allows free movement of legs
	nurse station	physical	33		1	desk leg area free of obstruction
	nurse station	physical	34		1	feet flat on the floor without undue pressure on user's backs of the leg
	nurse station	physical	35		1	forearms horizontal, at ease and comfortable
	nurse station	physical	36		1	screen display positioned so that user's eyes at roughly the same height as the top of the display screen
	nurse station	physical	37		1	user seated with straight back, supported by the chair
	nurse station	physical	38		1	user seated with relaxed shoulders
	nurse station	universal	39		1	chair adjusted correctly for current user
	nurse station	physical	40		1	workstation offers enough room to change position and vary movement
	nurse station	universal	41		1	workstation cables tidy, free of trip or snag hazards
	nurse station	universal	42		1	cupboards installed for basic nursing items (not medicines)
	nurse station	sensory	43		1	floor surface, slip-free and glare-free
	nurse station	universal	44		1	flooring adequately maintained
	nurse station	universal	45		0	floor and wall intersection coved to prevent dirt building up on floor corners
	nurse station	cognitive	46		0	tabard pinafore provided for medication rounds
	nurse station	cognitive	47		1	equipped with adequate stationeries and writing materials for note taking
	nurse station	cognitive	48		1	stores charts and notes for patient care-related documentation
	nurse station	cognitive	49		1	if only one nurse station, desktop and sitting accommodates at least one third of staff at a time for writing patient charts and documentation
	nurse station	cognitive	50		1	ward schedule planner/shift rota mounted on wall
	nurse station	sensory	51		0	acoustic insulation to reduce noise intrusion
	nurse station	sensory	52		1	all patient bays & side rooms visible from at least one nurse station
	nurse station	sensory	53		0	corridor wall glazed to enhance visibility to patient bays
	nurse station	sensory	54		0	glaze demarcation to enhance confidential telephone conversation
	nurse station	sensory	55		0	if no glaze demarcation, appropriate sound insulation facilitates confidential telephone conversation
	nurse station	sensory	56		1	natural daylight adequate without use of artificial lighting (ample, no glare)
	nurse station	sensory	57		0	ambient lighting fitted on desktop
	nurse station	universal	58		1	temperature satisfactory
	nurse station	sensory	59		1	sound level satisfactory
	nurse station	universal	60		0	natural air ventilation through window
	nurse station	universal	61		1	air quality satisfactory (not stuffy or draughty)
	nurse station	universal	62		1	observed air movement
	nurse station	sensory	63		1	absent of unpleasant smell
	nurse station	sensory	64		1	absent of conflicting sounds

	nurse station	physical	65		1	threshold avoided
		two-third rule:	72.22%	78.46%	51	

Appendix WB-WE02

Ward Environment Assessment Tool

Ward B – Patient Bay

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE02	patient bay	universal	1		1	separate male/female bays
	patient bay	physical	2		0	clear bed space at least 3.6 m wide and 3.7 m deep for each bed
	patient bay	physical	3		0	at least 1.5m around each side of the length of patient bed
	patient bay	physical	4		0	at least 1.3m at the leg end of each patient bed
	patient bay	physical	5		1	emergency buzzer installed and accessible near each patient bed, without moving bed
	patient bay	physical	6		1	for multi-occupancy room, minimum room width 4.5m to allow wheeling a second bed without disturbing the first
	patient bay	physical	7		1	distance from the closest nurse station not more than 30m
	patient bay	cognitive	8		1	the farthest patient bay doorway visible from at least one nurse station
	patient bay	cognitive	9		1	day room doorway visible from patient bay threshold
	patient bay	physical	10		1	plastic or wooden strip fitted on walls at 400-700mm height above floor level, to prevent damage by movement of beds
	patient bay	physical	11		1	night table installed next to each bed
	patient bay	physical	12		1	night table can be accessed without moving bed
	patient bay	physical	13		1	cupboard installed for patient personal belongings
	patient bay	physical	14		1	cupboard can be opened without moving bed
	patient bay	physical	15		1	cupboard fitted with lockable valuables section
	patient bay	physical	16		0	lockable section of cupboard coin-operated (keys often get lost)
	patient bay	physical	17		0	suitcase locker on top of cupboard
	patient bay	physical	18		1	cupboard hinges allow cupboard doors to open at least 135 degree
	patient bay	physical	19		0	lockable staff cupboard for basic nursing materials, not medicines (zero, if not lockable)
	patient bay	physical	20		0	room door at least 1260 x 2130mm
	patient bay	physical	21		0	room door fitted with sound insulation
	patient bay	physical	22		1	door closing mechanism overhead
	patient bay	physical	23		1	service supply duct runs behind the beds
	patient bay	physical	24		1	oxygen supply outlet within reach of each bed, without moving beds
	patient bay	physical	25		1	vacuum line installed in duct
	patient bay	physical	26		0	compressed air sockets within reach of each bed, without moving beds
	patient bay	physical	27		1	extra power points, unused, for movable equipment
	patient bay	physical	28		1	power points for patient use fitted, within reach of each bed, without moving beds
	patient bay	physical	29		0	reading lights for patient use installed, within reach of each bed, without moving beds
	patient bay	physical	30		1	emergency buzzer installed, within reach of each bed without moving beds
	patient bay	physical	31		1	all power cables and outlets are housed in the duct
	patient bay	physical	32		1	washbasin installed
	patient bay	physical	33		0	wc installed
	patient bay	physical	34		1	washbasin not more than 860mm from floor, to allow access by wheelchair users

	patient bay	physical	35		1	adequate leg space underneath washbasin to enhance access by wheelchair users
	patient bay	universal	36		0	a table (900 x 900mm for four patients) installed with a chair for each patient
	patient bay	physical	37		1	patient bed height adjustable electronically
	patient bay	physical	38		1	no trailing cords, wires or tubes
	patient bay	universal	39		0	rooms not overlooked by pedestrian route closer than 22m
	patient bay	physical	40		1	floor surface, seamless, slip-free and glare-free
	patient bay	physical	41		1	flooring adequately maintained
	patient bay	physical	42		1	floor and wall intersection coved to prevent dirt building up on floor corners
	patient bay	sensory	43		1	view of nurse station from at least one patient bed
	patient bay	cognitive	44		1	view of corridor activities (within ward) from all patient beds
	patient bay	sensory	45		0	natural daylight adequate without use of artificial lighting
	patient bay	sensory	46		0	light level satisfactory (ample, no glare)
	patient bay	cognitive	47		1	dark at night, or alternative blind mechanism installed
	patient bay	sensory	48		0	reading lights for patient use installed, within reach of each bed, controllable by patient, without moving beds
	patient bay	universal	49		1	temperature satisfactory
	patient bay	sensory	50		1	sound level satisfactory
	patient bay	sensory	51		1	window installed, glazed
	patient bay	sensory	52		1	air quality satisfactory (not stuffy or draughty)
	patient bay	sensory	53		1	natural air ventilation through window
	patient bay	universal	54		1	observed air movement
	patient bay	sensory	55		1	absence of unpleasant smell
	patient bay	cognitive	56		1	absence of conflicting sounds
	patient bay	cognitive	57		1	call system not disturbing at night
	patient bay	cognitive	58		1	patient bay door signage
	patient bay	cognitive	59		1	view of outside human activities from all patient beds
	patient bay	sensory	60		1	day room doorway visible from patient bay threshold
	patient bay	physical	61		1	accessible door fitted
	patient bay	cognitive	62		1	accessible doors fitted with signage to facilitate space identification and wayfinding
	patient bay	physical	63		1	accessible doors fitted with a door handle
	patient bay	physical	64		0	accessible doors fitted with an extra pull handle
	patient bay	sensory	65		1	accessible doors fitted with glazing a window
	patient bay	physical	66		1	accessible doors fitted with a kick plate
	patient bay	physical	67		1	kick plates between 0.30m and 0.40m in height
	patient bay	physical	68		0	door handles are lever-type handles, push plates or pull handles on swinging doors
	patient bay	physical	69		1	door handles located at a comfortable height between 0.90m and 1.00m from the floor surface
	patient bay	physical	70		1	round knobs are avoided
	patient bay	physical	71		0	doors with spring closers equipped with an extra pull handle approximately 0.30m in length
	patient bay	physical	72		1	doors with spring closers have extra pull handle mounted between 0.90m and 1.20m from the floor
	patient bay	physical	73		1	accessible door permits operation by one person, in a single motion, with one hand and with little effort
	patient bay	physical	74		1	for double-leaf doors, at least one leaf has a minimum clear width of 0.80m
	patient bay	physical	75		1	threshold avoided
	patient bay	cognitive	76		1	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	patient bay	cognitive	77		0	room numbers placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open

	patient bay	cognitive	78		0	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
	patient bay	cognitive	79		0	glazed doors clearly marked with a coloured band or mark placed at a height between 1.40m and 1.60m
		two-third rule:	90.80%	72.15%	57	

Appendix WB-WE03

Ward Environment Assessment Tool

Ward B – Side Room

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE03	side room	universal	1		1	at least two side rooms provided
	side room	universal	2		1	no shared side rooms
	side room	physical	3		1	distance from the closest nurse station not more than 20m
	side room	universal	4		0	minimum room size 20.0m square
	side room	universal	5		0	patient control of ventilation: window or air conditioning can be operated by wheelchair or bed-confined persons (zero if shared)
	side room	universal	6		0	patient control of lighting, other than main switch by door (zero if shared)
	side room	universal	7		0	chairs not wipe clean or plastic fabric
	side room	universal	8		0	en suite bathroom installed
	side room	universal	9		0	en suite wc installed
	side room	universal	10		1	en suite washbasin installed
	side room	universal	11		0	adequate clothes storage provided
	side room	universal	12		1	emergency buzzer installed
	side room	universal	13		0	provision of TV in room
	side room	universal	14		1	layout allows sitting space for visitors
	side room	physical	15		0	clear bed space at least 3.6 m wide and 3.7 m deep
	side room	physical	16		0	at least 1.5m space for wheelchair manoeuvre
	side room	physical	17		0	at least 1.5m around each side of the length of patient bed
	side room	physical	18		0	at least 1.3m at the leg end of each patient bed
	side room	physical	19		1	patient bed height adjustable electronically
	side room	physical	20		1	no trailing cords, wires or tubes
	side room	physical	21		0	secure handrail by washbasin and wc if provided
	side room	universal	22		1	soap dispenser and hand dryer/paper towel
	side room	universal	23		1	no unprotected heater or exposed hot pipes
	side room	universal	24		1	plastic or wooden strip fitted on walls at 400-700mm height above floor level, to prevent damage by movement of beds
	side room	universal	25		1	emergency buzzer allows for different room layouts without trailing cords
	side room	universal	26		0	lockable storage space
	side room	physical	27		1	if outside door is lockable from inside, emergency release locks from outside (e.g. with key or coin)
	side room	physical	28		1	floor surface, seamless, slip-free and glare-free
	side room	universal	29		1	flooring adequately maintained
	side room	universal	30		1	floor and wall intersection coved to prevent dirt building up on floor corners
	side room	sensory	31		1	day room doorway visible from side room threshold
	side room	sensory	32		1	at least one nurse station visible from side room threshold

	side room	cognitive	33		0	side room door glazed with blind and on-looking corridor or circulation area
	side room	cognitive	34		0	view of activities within building but outside day room from patient bed (e.g.. view of circulation space through glazed door window)
	side room	cognitive	35		0	view of corridor activities (within ward) from patient bed
	side room	cognitive	36		0	view of outside human activities (e.g. roads, shops)
	side room	cognitive	37		0	view of natural landscape or garden
	side room	sensory	38		1	dark at night, or alternative blind mechanism installed
	side room	sensory	39		0	natural daylight adequate without use of artificial lighting
	side room	sensory	40		1	light level satisfactory (ample, no glare)
	side room	sensory	41		0	reading lights for patient use installed, within reach of each bed, controllable by patient, without moving beds
	side room	universal	42		0	patient control of heating (zero if shared)
	side room	universal	43		1	stable heating in room
	side room	universal	44		1	temperature satisfactory
	side room	sensory	45		1	sound level satisfactory
	side room	sensory	46		0	window installed, glazed
	side room	universal	47		1	air quality satisfactory (not stuffy or draughty)
	side room	universal	48		1	observed air movement
	side room	sensory	49		1	absence of unpleasant smell
	side room	cognitive	50		1	absence of conflicting sound sources
	side room	cognitive	51		1	absence of distressing sounds
	side room	sensory	52		1	acoustic privacy (zero if room shared)
	side room	cognitive	53		1	call system not disturbing at night
	side room	physical	54		1	entrance door accessible
	side room	universal	55		1	entrance door lockable from inside
	side room	universal	56		1	if entrance door is lockable from inside, emergency release lock from outside (e.g. with key or coin)
	side room	cognitive	57		1	accessible door fitted with signage to facilitate space identification and wayfinding
	side room	physical	58		1	accessible door fitted with a door handle
	side room	physical	59		0	accessible door fitted with an extra pull handle
	side room	sensory	60		0	accessible door fitted with a glazed window
	side room	physical	61		1	accessible doors fitted with a kick plate
	side room	physical	62		1	kick plates between 0.30m and 0.40m in height
	side room	physical	63		1	door handles are lever-type handles, push plates or pull handles on swinging doors
	side room	physical	64		1	door handles located at a comfortable height between 0.90m and 1.00m from the floor surface
	side room	physical	65		1	round knobs are avoided
	side room	physical	66		0	door with spring closers equipped with an extra pull handle approximately 0.30m in length
	side room	physical	67		1	accessible doors permits operation by one person, in a single motion, with one hand and with little effort
	side room	physical	68		1	the minimum opening is at least 0.80m when the door is open
	side room	physical	69		1	for double-leaf doors, at least one leaf has a minimum clear width of 0.80m
	side room	physical	70		1	threshold avoided
	side room	universal	71		1	emergency release of lock of en suite door from inside room, e.g. with key or coin
	side room	cognitive	72		1	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	side room	cognitive	73		0	room number placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	side room	cognitive	74		1	contrast between door colour/door frame and adjoining walls facilitates visibility and identification

						by people with visual impairments
		two-third rule:	82.22%	63.51%	47	

Appendix WB-WE04

Ward Environment Assessment Tool

Ward B – Staff Room

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
	staff room	universal	1		1	staff room provided
	staff room	universal	2		1	away from patient bays to facilitate recreation and complete disconnection from ward activities
	staff room	universal	3		0	separate staff bath/shower
	staff room	universal	4		1	separate staff wc
	staff room	universal	5		1	changing room provided
	staff room	universal	6		0	changing room offer gender choices
	staff room	universal	7		1	lockable lockers for each member of staff
	staff room	universal	8		0	dining table for at least one-third of staffing level
	staff room	universal	9		0	dining chairs for at least one-third of staffing level
	staff room	universal	10		0	smoke-free area for eating separately from smokers
	staff room	physical	11		1	floor carpeted, seamless, slip-free and glare-free
	staff room	universal	12		1	flooring adequately maintained
	staff room	universal	13		1	floor and wall intersection coved to prevent dirt building up on floor corners
	staff room	universal	14		1	staff room with comfortable chairs for one-third number of staffing level
	staff room	sensory	15		0	natural daylight adequate without use of artificial lighting (ample, no glare)
	staff room	universal	16		1	temperature satisfactory
	staff room	sensory	17		1	sound level satisfactory
WE04	staff room	sensory	18		0	natural air ventilation through window
	staff room	universal	19		1	air quality satisfactory (not stuffy or draughty)
	staff room	sensory	20		1	absence of unpleasant smell
	staff room	universal	21		1	observed air movement
	staff room	cognitive	22		1	absence of conflicting sounds
	staff room	universal	23		1	access door passcode protected
	staff room	cognitive	24		1	access door fitted with signage to facilitate space identification and wayfinding
	staff room	physical	25		1	access door fitted with a door handle
	staff room	physical	26		0	access door fitted with an extra pull handle
	staff room	physical	27		1	access door fitted with a kick plate
	staff room	physical	28		1	kick plates between 0.30m and 0.40m in height
	staff room	physical	29		0	access door handles are lever-type handles, push plates or pull handles on swinging doors
	staff room	physical	30		1	access door handles located at a comfortable height between 0.90m and 1.00m from the floor surface
	staff room	physical	31		1	round knobs are avoided
	staff room	physical	32		1	access door with spring closers equipped with an extra pull handle approximately 0.30m in length
	staff room	physical	33		1	access door with spring closers have extra pull handle mounted between 0.90m and 1.20m from the floor
	staff room	physical	34		1	access door permit operation by one person, in a single motion, with one hand and with little effort
	staff room	physical	35		1	the minimum opening is at least 0.80m when the door is open

	staff room	physical	36		1	threshold avoided
	staff room	cognitive	37		1	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	staff room	cognitive	38		0	room numbers placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	staff room	cognitive	39		1	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	95.12%	74.36%	29	

Appendix WB-WE05

Ward Environment Assessment Tool

Ward B – Ward Manager's Office

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE05	ward manager's office	universal	1		1	separate ward manager's office provided
	ward manager's office	universal	2		1	accommodates at least four other people seated for short meetings
	ward manager's office	physical	3		1	floor carpeted, seamless, slip-free and glare-free
	ward manager's office	universal	4		1	flooring adequately maintained
	ward manager's office	universal	5		1	floor and wall intersection coved to prevent dirt building up on floor corners
	ward manager's office	cognitive	6		1	telephone installed for quick contact with nurse station or other multidisciplinary team members
	ward manager's office	cognitive	7		1	stationery and writing materials for note taking
	ward manager's office	cognitive	8		1	acoustic insulation to reduce noise intrusion
	ward manager's office	universal	9		1	natural air ventilation through window
	ward manager's office	sensory	10		1	natural daylight adequate without use of artificial lighting (ample, no glare)
	ward manager's office	sensory	11		0	ambient lighting fitted on desktop
	ward manager's office	sensory	12		1	temperature satisfactory
	ward manager's office	sensory	13		1	sound level satisfactory
	ward manager's office	universal	14		1	air quality satisfactory (not stuffy or draughty)
	ward manager's office	sensory	15		1	observed air movement
	ward manager's office	sensory	16		1	absent of unpleasant smell
	ward manager's office	sensory	17		1	absent of conflicting sounds
	ward manager's office	physical	18		1	access door fitted, not open access
	ward manager's office	universal	19		1	access door lockable from outside or passcode protected

	ward manager's office	physical	20		1	access door lockable from inside
	ward manager's office	physical	21		0	access door fitted with signage to facilitate space identification and wayfinding
	ward manager's office	physical	22		1	access door fitted with a door handle
	ward manager's office	physical	23		0	access door fitted with an extra pull handle
	ward manager's office	sensory	24		1	access door fitted with a glazed window
	ward manager's office	physical	25		1	access door fitted with a kick plate
	ward manager's office	physical	26		1	access door kick plates between 0.30m and 0.40m in height
	ward manager's office	physical	27		1	access door handles are lever-type handles, push plates or pull handles on swinging doors
	ward manager's office	physical	28		1	access door handles located at a comfortable height between 0.90m and 1.00m from the floor surface
	ward manager's office	physical	29		1	round knobs are avoided
	ward manager's office	physical	30		0	access door with spring closers equipped with an extra pull handle approximately 0.30m in length
	ward manager's office	physical	31		0	access door permits operation by one person, in a single motion, with one hand and with little effort
	ward manager's office	physical	32		1	access door minimum opening is at least 0.80m when the door is open
	ward manager's office	physical	33		1	threshold avoided
	ward manager's office	cognitive	34		0	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	ward manager's office	cognitive	35		0	room numbers placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	ward manager's office	cognitive	36		0	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	92.31%	77.78%	28	

Appendix WB-WE06

Ward Environment Assessment Tool

Ward B – Doctor's Office

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE06	doctor's office	universal	1		1	separate doctor's office provided
	doctor's office	universal	2		1	accommodates at least four other people seated for short meetings
	doctor's office	physical	3		1	floor carpeted, seamless, slip-free and glare-free
	doctor's office	universal	4		1	flooring adequately maintained
	doctor's office	physical	5		0	floor and wall intersection curved to prevent dirt building up on floor corners
	doctor's office	universal	6		1	telephone installed for quick contact with nurse station or other multidisciplinary team members
	doctor's office	cognitive	7		1	stationery and writing materials for note taking
	doctor's office	cognitive	8		0	acoustic insulation to reduce noise intrusion

	doctor's office	sensory	9		1	natural air ventilation through window
	doctor's office	sensory	10		1	natural daylight adequate without use of artificial lighting (ample, no glare)
	doctor's office	sensory	11		0	ambient lighting fitted on desktop
	doctor's office	universal	12		1	temperature satisfactory
	doctor's office	sensory	13		1	sound level satisfactory
	doctor's office	universal	14		1	air quality satisfactory (not stuffy or draughty)
	doctor's office	universal	15		1	observed air movement
	doctor's office	sensory	16		1	absent of unpleasant smell
	doctor's office	cognitive	17		1	absent of conflicting sounds
	doctor's office	sensory	18		1	access door lockable from outside or passcode protected
	doctor's office	universal	19		1	access door lockable from inside
	doctor's office	cognitive	20		1	access door fitted with signage to facilitate space identification and wayfinding
	doctor's office	physical	21		1	access door fitted with a door handle
	doctor's office	physical	22		0	access door fitted with an extra pull handle
	doctor's office	physical	23		1	access door fitted with a kick plate
	doctor's office	physical	24		1	access door kick plates between 0.30m and 0.40m in height
	doctor's office	physical	25		1	access door handles are lever-type handles, push plates or pull handles on swinging doors
	doctor's office	physical	26		1	access door handles located at a comfortable height between 0.90m and 1.00m from the floor surface
	doctor's office	physical	27		1	round knobs are avoided
	doctor's office	sensory	28		0	access door with spring closers equipped with an extra pull handle approximately 0.30m in length
	doctor's office	physical	29		1	access door permits operation by one person, in a single motion, with one hand and with little effort
	doctor's office	physical	30		1	access door minimum opening is at least 0.80m when the door is open
	doctor's office	physical	31		1	threshold avoided
	doctor's office	cognitive	32		1	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	doctor's office	cognitive	33		0	room numbers placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	doctor's office	cognitive	34		1	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	91.89%	82.35%	28	

Appendix WB-WE07

Ward Environment Assessment Tool

Ward B – Day Room

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE07	day room	universal	1		1	day room provided
	day room	universal	2		1	room not through passageway to other parts of ward area
	day room	universal	3		1	external windows secured against intrusion
	day room	universal	4		1	windows with blinds for privacy, e.g.. for patient-family discussions
	day room	universal	5		1	room large enough for family gatherings

	day room	universal	6		0	TV installed for patient use
	day room	universal	7		1	choice of location for daytime activities
	day room	universal	8		0	adequate space for special support seating: at least two groups of patient-family discussions can take place simultaneously
	day room	universal	9		1	floor carpeted, slip-free and glare-free
	day room	universal	10		1	flooring adequately maintained
	day room	universal	11		0	floor and wall intersection coved to prevent dirt building up on floor corners
	day room	physical	12		1	at least 1.3m turning space for wheelchair
	day room	universal	13		1	various styles of chairs and settees
	day room	universal	14		1	chairs not wipe clean or plastic fabric
	day room	physical	15		0	tables or writing desks accessible by wheelchair users
	day room	universal	16		1	no unprotected heaters or exposed hot pipes
	day room	physical	17		1	doorway accessible by wheelchair users
	day room	physical	18		1	doorway accessible by independent patients using mobility devices, e.g. walking frames
	day room	cognitive	19		0	design is homelike, emulates domestic environment
	day room	cognitive	20		0	dayroom recognisable by its function
	day room	cognitive	21		0	signage on door to aid patient wayfinding
	day room	cognitive	22		0	signage in room to aid patient orientation
	day room	sensory	23		1	glazed window in access door to day room
	day room	sensory	24		1	doorway or room traffic visible from at least one nursing station
	day room	universal	25		0	room equipped with small lamps for individual activities (e.g. reading)
	day room	sensory	26		0	acoustic privacy, e.g. sound absorbent surfaces
	day room	universal	27		1	natural air ventilation through window
	day room	sensory	28		0	natural daylight adequate without use of artificial lighting (ample, no glare)
	day room	sensory	29		1	light level satisfactory (ample, no glare)
	day room	universal	30		1	temperature satisfactory
	day room	sensory	31		1	sound level satisfactory
	day room	universal	32		1	no wc door immediately opposite day room
	day room	universal	33		1	air quality satisfactory (not stuffy or draughty)
	day room	universal	34		1	observed air movement
	day room	sensory	35		1	absence of unpleasant smell
	day room	cognitive	36		1	absence of conflicting sound sources
	day room	universal	37		1	call system not disturbing at night
	day room	cognitive	38		0	maximum windowsill height 600mm
	day room	cognitive	39		0	view of outside human activities (e.g.. roads, shops)
	day room	cognitive	40		1	view of natural landscape or garden
	day room	cognitive	41		1	view of activities within building but outside day room (e.g. view of circulation spaces through internal window)
	day room	universal	42		1	variation in temperature within room
	day room	cognitive	43		0	access door fitted with signage to facilitate space identification and wayfinding
	day room	physical	44		1	access door fitted with a door handle
	day room	physical	45		0	access door fitted with an extra pull handle
	day room	sensory	46		1	access door fitted with a glazed window
	day room	physical	47		0	access door fitted with a kick plate
	day room	physical	48		1	access door handles are lever-type handles, push plates or pull handles on swinging doors
	day room	physical	49		1	access door handles located at a comfortable height between 0.90m and 1.00m from the floor surface
	day room	physical	50		1	round knobs are avoided

	day room	physical	51		1	access door permits operation by one person, in a single motion, with one hand and with little effort
	day room	physical	52		1	access door minimum opening is at least 0.80m when the door is open
	day room	physical	53		1	threshold avoided
	day room	cognitive	54		0	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	day room	cognitive	55		0	room numbers placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	day room	cognitive	56		1	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	91.80%	67.86%	38	

Appendix WB-WE08

Ward Environment Assessment Tool

Ward B – Corridor

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE08	corridor	cognitive	1		1	corridor traffic visible from at least one nursing station
	corridor	universal	2		1	entrance area welcoming to visitors: reception and signposting
	corridor	universal	3		1	safeguards against unwanted visitors (e.g. staffed reception area)
	corridor	sensory	4		1	offers direct visual path between main entrance and reception or to at least one nurse station
	corridor	cognitive	5		1	signage to aid wayfinding and orientation
	corridor	cognitive	6		0	noticeboard with information for visitors
	corridor	cognitive	7		0	colour-coding to aid spatial differentiation of ward elements opening from corridor
	corridor	cognitive	8		0	external reference views visible from corridor (visible landmarks that assist indoor orientation, e.g. roads, buildings)
	corridor	universal	9		0	emergency buzzer points at intervals of 10m throughout corridors
	corridor	universal	10		1	unrestricted access for ambulant and independent patients
	corridor	physical	11		1	unrestricted through access by wheelchair users
	corridor	physical	12		1	unrestricted through access by ambulant patients using mobility devices (e.g. zimmer frames)
	corridor	cognitive	13		1	all patient-accessible spaces easy to supervise by nursing staff
	corridor	physical	14		1	all patient-accessible spaces easy to access
	corridor	universal	15		0	staff photographs on display
	corridor	physical	16		1	public telephone facilities at suitable heights for wheelchair users
	corridor	physical	17		0	at least 2.5m wide for patient transport on beds and trolleys
	corridor	physical	18		1	effective width not constricted by projections, columns, or other building elements
	corridor	physical	19		1	suspended corridor ceiling not less than 2.4m high
	corridor	physical	20		0	to facilitate use by ambulant disabled and elderly people, handrails mounted between 0.85m and 0.95m above the finished floor level
	corridor	physical	21		0	for the benefit of wheelchair users, a second handrail mounted between 0.70m and 0.75m from the finished floor level
	corridor	physical	22		1	floor surfaces, seamless, non-slip and even
	corridor	physical	23		1	flooring securely fastened
	corridor	physical	24		1	no thresholds or steps on corridors
	corridor	universal	25		0	floor and wall intersection coved to prevent dirt building up on floor corners
	corridor	physical	26		1	all ward spaces accessible from corridor without steps

	corridor	physical	27		1	all ward spaces accessible with zero gradient, or slope not more than 1.3 degree
	corridor	universal	28		1	no unprotected heaters or exposed hot pipes
	corridor	universal	29		0	plastic or wooden strip fitted on walls at 400-700mm height above floor level, to prevent damage by movement of beds
	corridor	physical	30		1	at least one patient wc accessible from corridor by wheelchair users
	corridor	physical	31		1	at least one visitor wc accessible from corridor by wheelchair users
	corridor	physical	32		0	door handles are lever with return
	corridor	physical	33		1	door closers to day room, bathroom, wc, are hold-open or free-swing
	corridor	cognitive	34		1	visual contrast between fittings (handrails, door handles, switches) and background
	corridor	universal	35		1	no barriers e.g. fire doors, without hold-open
	corridor	physical	36		1	no other observed barriers
	corridor	cognitive	37		0	absence of distracting or confusing background noise from medical equipment
	corridor	cognitive	38		0	corridor has view of outside human activities (e.g. roads, shops)
	corridor	sensory	39		0	corridor has exterior window or other form of natural light
	corridor	sensory	40		0	windows for lighting and ventilation not further than 8m apart
	corridor	sensory	41		0	adequate natural light
	corridor	sensory	42		0	light level satisfactory (ample, no glare)
	corridor	universal	43		0	temperature satisfactory
	corridor	sensory	44		1	sound level satisfactory
	corridor	sensory	45		1	air quality satisfactory (not stuffy or draughty)
	corridor	universal	46		1	observed air movement
	corridor	sensory	47		0	absence of unpleasant smell
	corridor	cognitive	48		1	absence of conflicting other sounds
	corridor	cognitive	49		1	call system not disturbing at night
	corridor	sensory	50		1	patient accessible telephone
	corridor	sensory	51		0	intentionally brighter lighting at corners and transitions
		two-third rule:	89.47%	60.78%	31	

Appendix WB-WE09

Ward Environment Assessment Tool

Ward B – Storage Room

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE09	storage room	universal	1		0	space for wheelchairs equivalent to number of patient beds
	storage room	universal	2		0	space to store at least one mobile hoist
	storage room	universal	3		0	space to store mobility devices (e.g. zimmer frames)
	storage room	universal	4		1	space to store linens and supplies
	storage room	sensory	5		0	natural daylight adequate without use of artificial lighting (ample, no glare)
	storage room	sensory	6		0	ambient lighting fitted for worktop
	storage room	universal	7		0	temperature satisfactory
	storage room	sensory	8		1	sound level satisfactory
	storage room	universal	9		1	air ventilator or window installed
	storage	universal	10		1	air quality satisfactory (not stuffy or draughty)

	room					
	storage room	universal	11		1	observed air movement
	storage room	sensory	12		1	absence of unpleasant smell
	storage room	cognitive	13		1	absence of conflicting sounds
	storage room	cognitive	14		0	item spaces colour-coded for easy identification
	storage room	cognitive	15		1	access door fitted with signage to facilitate space identification and wayfinding
	storage room	physical	16		1	access door fitted with a door handle
	storage room	physical	17		0	access door fitted with an extra pull handle
	storage room	sensory	18		0	access door fitted with a glazed window
	storage room	physical	19		1	access door fitted with a kick plate
	storage room	physical	20		1	access door kick plates between 0.30m and 0.40m in height
	storage room	physical	21		1	access door handles are lever-type handles, push plates or pull handles on swinging doors
	storage room	physical	22		1	access door handles located at a comfortable height between 0.90m and 1.00m from the floor surface
	storage room	physical	23		1	round knobs are avoided
	storage room	physical	24		0	access door with spring closers equipped with an extra pull handle approximately 0.30m in length
	storage room	physical	25		1	access door permits operation by one person, in a single motion, with one hand and with little effort
	storage room	physical	26		1	access door minimum opening is at least 0.80m when the door is open
	storage room	physical	27		1	threshold avoided
	storage room	cognitive	28		1	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	storage room	cognitive	29		0	room numbers placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	storage room	cognitive	30		0	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	90.91%	60.00%	18	

Appendix WB-WE10

Ward Environment Assessment Tool

Ward B – Clean Utility

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE10	clean utility	universal	1		1	hand wash basin installed
	clean utility	universal	2		1	soap dispenser and hand towels facilities installed
	clean utility	universal	3		1	pharmacy return skip installed
	clean utility	universal	4		0	segregated waste disposal skips installed
	clean utility	universal	5		1	separate skip for medical wastes (syringes and cannulas and waste medicines)
	clean utility	cognitive	6		1	at least 120 x 60 cm worktop for medicine preparation, calculation and related documentation
	clean utility	universal	7		1	worktop surfaces covered with infection resistant finishing
	clean utility	sensory	8		1	worktop surfaces free of glare and reflection
	clean utility	cognitive	9		1	medicine cabinets labelled
	clean utility	cognitive	10		0	medicine cabinets colour coded

	clean utility	universal	11		1	disposable gloves provided
	clean utility	physical	12		1	floor surface, slip-free and glare-free
	clean utility	universal	13		1	flooring adequately maintained
	clean utility	universal	14		1	floor and wall intersection curved to prevent dirt building up on floor corners
	clean utility	physical	15		1	sufficient floor space to accommodate at least two members of staff
	clean utility	cognitive	16		0	network computer provided for quick access to medicines and pharmaceutical instructions
	clean utility	cognitive	17		0	telephone installed for quick contact with nurse station or to consult other multidisciplinary team members
	clean utility	cognitive	18		0	stationery and writing materials for note taking
	clean utility	cognitive	19		0	acoustic insulation to reduce noise intrusion
	clean utility	sensory	20		0	natural daylight adequate without use of artificial lighting (ample, no glare)
	clean utility	sensory	21		0	ambient lighting fitted for worktop
	clean utility	universal	22		1	temperature satisfactory
	clean utility	sensory	23		1	sound level satisfactory
	clean utility	sensory	24		1	air quality satisfactory (not stuffy or draughty)
	clean utility	sensory	25		1	observed air movement
	clean utility	sensory	26		1	absence of unpleasant smell
	clean utility	cognitive	27		1	absence of conflicting sounds
	clean utility	physical	28		1	access door passcode protected
	clean utility	cognitive	29		0	access door with turn on/off signage to indicate medication calculation in progress
	clean utility	physical	30		1	access door with spring closes without extra effort
	clean utility	cognitive	31		1	access door fitted with signage to facilitate space identification and wayfinding
	clean utility	physical	32		0	access door fitted with a door handle
	clean utility	physical	33		0	access door fitted with an extra pull handle
	clean utility	sensory	34		1	access door fitted with a glazed window with blind mechanism
	clean utility	physical	35		1	access door fitted with a kick plate
	clean utility	physical	36		1	access door kick plates between 0.30m and 0.40m in height
	clean utility	physical	37		0	access door with spring closers equipped with an extra pull handle approximately 0.30m in length
	clean utility	physical	38		1	access door permits operation by one person, in a single motion, with one hand and with little effort
	clean utility	physical	39		1	access door minimum opening is at least 0.80m when the door is open
	clean utility	physical	40		1	threshold avoided
	clean utility	cognitive	41		0	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	clean utility	cognitive	42		0	room numbers placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	clean utility	cognitive	43		0	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	87.76%	65.12%	28	

Appendix WB-WE11

Ward Environment Assessment Tool

Ward B – Sluice

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE11	sluice	physical	1		1	sluice not more than 30m from the farthest patient room
	sluice	universal	2		1	sluice walls tiled or covered with infection resistant finishing
	sluice	sensory	3		1	means of removing smell (extractor or window) from sluice
	sluice	universal	4		1	different types of waste adequately segregated by skip type and/or colour coded
	sluice	sensory	5		1	waste containers/skips fitted with lids to prevent odours escaping
	sluice	sensory	6		1	access door lockable from outside or passcode protected
	sluice	sensory	7		1	access door spring closes automatically to prevent odour escaping
	sluice	cognitive	8		1	access door fitted with signage to facilitate space identification and wayfinding
	sluice	physical	9		1	access door fitted with a door handle
	sluice	physical	10		0	access door fitted with an extra pull handle
	sluice	sensory	11		0	access door fitted with a glazed window
	sluice	physical	12		1	access door fitted with a kick plate
	sluice	physical	13		1	access door kick plates between 0.30m and 0.40m in height
	sluice	physical	14		1	access door handles located at a comfortable height between 0.90m and 1.00m from the floor surface
	sluice	physical	15		1	round knobs are avoided
	sluice	physical	16		1	access door permits operation by one person, in a single motion, with one hand and with little effort
	sluice	physical	17		1	access door minimum opening at least 0.80m when the door is open
	sluice	physical	18		1	threshold avoided
	sluice	cognitive	19		1	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	sluice	cognitive	20		0	room number placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	sluice	cognitive	21		1	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	95.45%	85.71%	18	

Appendix WB-WE12

Ward Environment Assessment Tool

Ward B – Bathroom & WC

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE12	bathroom & wc	universal	1		1	medical fittings are discreet in bathrooms and wcs
	bathroom & wc	physical	2		1	at least one wc has enough space for a patient and the carer inside with door shut
	bathroom & wc	universal	3		1	no grouped wc separated only by partition
	bathroom & wc	physical	4		1	bathroom contains a wc (not commode)
	bathroom & wc	physical	5		1	wheelchair accessible bathroom & wc

	bathroom & wc	physical	6		1	wc at least 1.5m by 1.5m to allow parallel approach of wheelchair to wc
	bathroom & wc	physical	7		1	wc allows at least 1.5m in diameter for full 360 degree manoeuvring of wheelchair
	bathroom & wc	universal	8		0	storage/display space for personal items
	bathroom & wc	universal	9		1	access door lockable from inside
	bathroom & wc	universal	10		0	bathroom/wc with fittings (bath, wc, washbasins) not visible from open door
	bathroom & wc	universal	11		1	visual privacy within bathroom from nursing staff, e.g. alcove or screen
	bathroom & wc	universal	12		1	emergency access: door opens out with at least 1.2m clear space to avoid fallen patient becoming trapped
	bathroom & wc	universal	13		1	emergency release of lock from outside, e.g. with key or coin
	bathroom & wc	universal	14		1	emergency buzzer installed
	bathroom & wc	universal	15		1	separate visitor wc on corridor/circulating areas
	bathroom & wc	physical	16		1	a handle placed on the door from the inside to facilitate closing
	bathroom & wc	physical	17		1	another handle placed on door outside
	bathroom & wc	physical	18		1	for doors installed in an opening or wall more than 0.60m thick, the clear door opening is at least 0.90m wide
	bathroom & wc	physical	19		1	operational devices on doors, such as handles, pulls, latches and locks, easy to grasp with one hand
	bathroom & wc	physical	20		1	handrails installed in wc, bathtub and shower to assist disabled persons to use the facilities safely and easily
	bathroom & wc	physical	21		1	handrails have a diameter of 30mm to 40mm
	bathroom & wc	physical	22		1	handrails firmly fixed with stand loads and have non-slip surfaces
	bathroom & wc	physical	23		1	single-lever mixing-type taps or push-buttons taps easily operable by hand or elbow
	bathroom & wc	physical	24		1	clearance between the grip of the tap and any adjacent vertical surface not less than 35mm
	bathroom & wc	universal	25		0	telephone fixtures with a cord at least 1.50m long are installed
	bathroom & wc	physical	26		1	no doorsteps installed
	bathroom & wc	physical	27		1	no slope, except for drainage
	bathroom & wc	physical	28		1	threshold avoided
	bathroom & wc	physical	29		1	flooring materials slip-proof
	bathroom & wc	physical	30		1	flooring materials easy to clean
	bathroom & wc	physical	31		1	floor well-drained and provided with adequate waterproofing
	bathroom & wc	physical	32		1	pipes fitted in the wall
	bathroom & wc	universal	33		1	all exposed hot water pipes insulated or covered
	bathroom & wc	universal	34		0	choice of bath or shower
	bathroom & wc	physical	35		0	at least one bathroom with equipment for assisted bathing
	bathroom & wc	physical	36		0	at least one bathtub with integral sitting area at non-tap end
	bathroom & wc	physical	37		1	at least one bathroom with shower for wheelchair access
	bathroom & wc	physical	38		1	drain openings in shower is placed in a corner of the stall so that slip-resistant rubber mats can be used
	bathroom & wc	physical	39		1	shower dimensions are at least 2.4m by 1.5m and allow 1.5m diameter for full 360 degree manoeuvring of wheelchair
	bathroom & wc	physical	40		1	floor of the shower stall not more than 20mm below the level of the surrounding floor area
	bathroom & wc	physical	41		0	shower stall with a beveled threshold not exceeding 13mm above the finished floor
	bathroom & wc	physical	42		1	shower seat conveniently positioned for the shower head at a height between 0.45m and 0.50m
	bathroom & wc	physical	43		1	toilet seats, bidets, shower seats and bath-tub seat mounted at the same height of the wheelchair seat, i.e. between 0.45m and 0.50 m above floor level.
	bathroom & wc	physical	44		1	handrail placed on the wall opposite the shower seat and mounted at a height between 0.85m and 0.95m
	bathroom & wc	physical	45		1	wheelchair access to opening size of door: min 30cm wall width

	bathroom & wc	physical	46		1	at least 1.3m turning space for wheelchairs in bathrooms
	bathroom & wc	physical	47		0	fittings accessible by carer from each side
	bathroom & wc	physical	48		1	secure handrails to bath, wc, and washbasin, mounted at a height between 0.85 m and 0.95 m.
	bathroom & wc	physical	49		1	padded backrest on wc
	bathroom & wc	sensory	50		1	visual contrast between fittings and background
	bathroom & wc	physical	51		1	ergonomic fittings to bath, washbasins & wc (e.g. flush is lever, large & smooth to hold; taps are cross-top or lever)
	bathroom & wc	universal	52		0	bathroom has shaver point
	bathroom & wc	universal	53		1	all accessories, such as soap, towel, hand dryer and toilet paper dispensers are provided
	bathroom & wc	physical	54		0	all accessories, such as soap, towel, hand dryer and toilet paper dispensers are placed at a height between 0.50 m and 1.20 m from the finished floor level
	bathroom & wc	universal	55		0	at least one accessible urinal provided
	bathroom & wc	physical	56		0	lower edge of mirrors positioned at a height not exceeding 1.00m
	bathroom & wc	sensory	57		1	means of removing smell (extractor or window) in wc and bathroom with wcs
		two-third rule:	81.43%	78.95%	45	

Appendix WB-WE13

Ward Environment Assessment Tool

Ward B – Kitchen

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE13	kitchen	universal	1		0	annexed to nurse station
	kitchen	universal	2		1	if not annexed to nurse station, not farther than 25m metres from the farthest nurse stations
	kitchen	physical	3		1	at least 140 cm by 60cm clear worktop space for meal preparation
	kitchen	universal	4		1	vending machine for snacks, cold drinks
	kitchen	universal	5		1	microwave for meal heating
	kitchen	universal	6		1	refrigerator for cold meal storage
	kitchen	universal	7		1	water heating device to make hot drinks
	kitchen	universal	8		1	tea making machine provided
	kitchen	universal	9		1	coffee making machine provided
	kitchen	sensory	10		1	kitchen worktop free of glare and reflection
	kitchen	cognitive	11		0	acoustic insulation to reduce noise intrusion
	kitchen	sensory	12		0	natural daylight adequate without use of artificial lighting (ample, no glare)
	kitchen	sensory	13		0	ambient lighting fitted for worktop
	kitchen	universal	14		1	temperature satisfactory
	kitchen	sensory	15		1	sound level satisfactory
	kitchen	universal	16		1	air quality satisfactory (not stuffy or draughty)
	kitchen	universal	17		1	observed air movement
	kitchen	sensory	18		1	absence of unpleasant smell
	kitchen	cognitive	19		1	absence of conflicting sounds
	kitchen	universal	20		1	if not annexed to nurse station, access door lockable from outside or passcode protected
	kitchen	physical	21		1	access door spring closes automatically to prevent odour escaping
	kitchen	physical	22		1	access door fitted with signage to facilitate space identification and wayfinding

	kitchen	physical	23		0	access door fitted with a door handle
	kitchen	physical	24		0	access door fitted with an extra pull handle
	kitchen	sensory	25		1	access door fitted with a glazed window
	kitchen	physical	26		1	access door fitted with a kick plate
	kitchen	physical	27		1	access door kick plates between 0.30m and 0.40m in height
	kitchen	physical	28		1	access door permits operation by one person, in a single motion, with one hand and with little effort
	kitchen	physical	29		1	access door minimum opening at least 0.80m when the door is open
	kitchen	physical	30		1	threshold avoided
	kitchen	cognitive	31		1	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	kitchen	cognitive	32		0	room number placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	kitchen	cognitive	33		0	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	91.67%	75.76%	25	

Appendix WB-WE14

Ward Environment Assessment Tool

Ward B – Entrance & Exit

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE14	entrances & exits	sensory	1		1	at least one entrance or exit visible from at least one nursing station
	entrances & exits	physical	2		1	no threshold
	entrances & exits	physical	3		1	kick plates between 0.30m and 0.40m in height
	entrances & exits	physical	4		1	doorway accessible by ambulant and independent patients
	entrances & exits	physical	5		1	doorway accessible by wheelchair users
	entrances & exits	physical	6		1	door accessible by ambulant patients using mobility devices (e.g. zimmer frames)
	entrances & exits	sensory	7		1	swinging doors on corridors have glazed low windows to enable users to see oncoming traffic
	entrances & exits	sensory	8		0	glazed doors clearly marked with a coloured band or mark placed at a height between 1.40m and 1.60m
	entrances & exits	sensory	9		1	bottom edge of the window on swinging corridor doors not higher than 1.00m from the finished floor level
	entrances & exits	cognitive	10		1	colour of the entrance door contrasts with the surrounding surface, to be distinguishable by people with sight problems
	entrances & exits	physical	11		0	handles are lever-type handles, push plates or pull handles on swinging doors
	entrances & exits	physical	12		1	operational devices on doors, such as handles, pulls, latches and locks, easy to grasp with one hand
	entrances & exits	physical	13		1	door handles located at a comfortable height between 0.90m and 1.00m from the floor surface
	entrances & exits	physical	14		1	round knobs are avoided
	entrances & exits	physical	15		1	doors with spring closers equipped with an extra pull handle approximately 0.30m in length
	entrances & exits	physical	16		0	doors with spring closers have extra pull handle located between 0.20m and 0.30m from the hinged side of door
	entrances & exits	physical	17		1	accessible doors have the following features: a sign, a door handle, an extra pull handle, glazing and a kick plate
	entrances & exits	physical	18		1	entrance & exit doors permits operation by one person, in a single motion, with one hand and with little effort
	entrances & exits	physical	19		1	vestibules avoided between two sets of doors

	entrances & exits	cognitive	20		1	signage to facilitate wayfinding
	entrances & exits	cognitive	21		1	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	70.00%	85.71%	18	

Appendix WC-WE01

Ward Environment Assessment Tool

Ward C – Nurses Station

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE01	nurse station	physical	1		1	staff kitchen not farther than 25 metres from the farthest nurse station
	nurse station	physical	2		1	staff WC separate from patients' and visitors' facilities
	nurse station	physical	3		0	staff WC offers gender choices
	nurse station	universal	4		1	at least two nursing computer workstations with ergonomic seating
	nurse station	universal	5		1	accommodates at least two further nursing staff sitting to facilitate team collaboration and short meetings
	nurse station	physical	6		0	desktop height adjustable
	nurse station	physical	7		1	if desktop height not adjustable, then desktop not more 75cm from floor finishing
	nurse station	universal	8		0	desktop surfaces covered with infection resistant finishing
	nurse station	universal	9		1	desktop with bar to conceal paperwork from visitors/outsiders
	nurse station	physical	10		1	computer keyboard separate from screen
	nurse station	physical	11		1	computer keyboard tilt to allow flexible keying positions for different users
	nurse station	sensory	12		1	computer keyboard characters clear and readable
	nurse station	sensory	13		1	computer keyboard free of glare and reflection
	nurse station	physical	14		1	computer mouse positioned close to user without need to stretch
	nurse station	universal	15		1	computer mouse allows flexibility in positions for multiple users (considers both left and right hand users)
	nurse station	physical	16		1	user's wrist and forearm can be supported on desktop
	nurse station	sensory	17		1	display screen clear and readable
	nurse station	sensory	18		1	display screen free of glare and reflection
	nurse station	physical	19		1	display screen swivel and tilt
	nurse station	sensory	20		0	if display screen placed facing a window, adjustable blinds installed
	nurse station	sensory	21		0	if window blinds not suitable to remove glare and reflection, anti-glare screen filters provided
	nurse station	universal	22		1	desktop surface large enough for all equipment, papers, etc., considering multiple users
	nurse station	universal	23		1	desktop surface tidy, not overcrowded
	nurse station	physical	24		1	all equipment on desktop reachable by user, considering multiple user
	nurse station	universal	25		1	desktop offers rearrangement options for multiple users
	nurse station	sensory	26		1	desktop surfaces free from glare and reflection
	nurse station	universal	27		1	chairs suitable
	nurse station	physical	28		1	chairs stable
	nurse station	physical	29		1	chair seat has back height and tilt adjustments
	nurse station	physical	30		1	seat height adjustable
	nurse station	physical	31		1	chair glides for flexible positions

	nurse station	physical	32		1	small of the back supported by chair's backrest
	nurse station	physical	33		1	desk leg area allows free movement of legs
	nurse station	physical	34		1	desk leg area free of obstruction
	nurse station	physical	35		1	feet flat on the floor without undue pressure on user's backs of the leg
	nurse station	physical	36		1	forearms horizontal, at ease and comfortable
	nurse station	physical	37		1	screen display positioned so that user's eyes at roughly the same height as the top of the display screen
	nurse station	physical	38		1	user seated with straight back, supported by the chair
	nurse station	physical	39		1	user seated with relaxed shoulders
	nurse station	universal	40		1	chair adjusted correctly for current user
	nurse station	physical	41		1	workstation offers enough room to change position and vary movement
	nurse station	universal	42		1	workstation cables tidy, free of trip or snag hazards
	nurse station	universal	43		1	cupboards installed for basic nursing items (not medicines)
	nurse station	sensory	44		1	floor surface, slip-free and glare-free
	nurse station	universal	45		1	flooring adequately maintained
	nurse station	universal	46		0	floor and wall intersection coved to prevent dirt building up on floor corners
	nurse station	cognitive	47		0	tabard pinafore provided for medication rounds
	nurse station	cognitive	48		1	equipped with adequate stationeries and writing materials for note taking
	nurse station	cognitive	49		1	stores charts and notes for patient care-related documentation
	nurse station	cognitive	50		0	if only one nurse station, desktop and sitting accommodates at least one third of staff at a time for writing patient charts and documentation
	nurse station	cognitive	51		0	ward schedule planner/shift rota mounted on wall
	nurse station	sensory	52		0	acoustic insulation to reduce noise intrusion
	nurse station	sensory	53		0	all patient bays & side rooms visible from at least one nurse station
	nurse station	sensory	54		0	corridor wall glazed to enhance visibility to patient bays
	nurse station	sensory	55		0	if no glaze demarcation, appropriate sound insulation facilitates confidential telephone conversation
	nurse station	sensory	56		1	natural daylight adequate without use of artificial lighting (ample, no glare)
	nurse station	sensory	57		0	ambient lighting fitted on desktop
	nurse station	universal	58		1	temperature satisfactory
	nurse station	sensory	59		1	sound level satisfactory
	nurse station	universal	60		1	natural air ventilation through window
	nurse station	universal	61		1	air quality satisfactory (not stuffy or draughty)
	nurse station	universal	62		1	observed air movement
	nurse station	sensory	63		1	absent of unpleasant smell
	nurse station	sensory	64		1	absent of conflicting sounds
	nurse station	physical	65		0	access door/barrier fitted, not open access
	nurse station	physical	66		1	threshold avoided
		two-third rule:	75.86%	77.27%	51	

Appendix WC-WE02

Ward Environment Assessment Tool

Ward C – Patient Bay

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE02	patient bay	universal	1		1	separate male/female bays
	patient bay	physical	2		1	clear bed space at least 3.6 m wide and 3.7 m deep for each bed
	patient bay	physical	3		0	at least 1.5m around each side of the length of patient bed
	patient bay	physical	4		0	at least 1.3m at the leg end of each patient bed
	patient bay	physical	5		1	emergency buzzer installed and accessible near each patient bed, without moving bed
	patient bay	physical	6		1	for multi-occupancy room, minimum room width 4.5m to allow wheeling a second bed without disturbing the first
	patient bay	physical	7		1	distance from the closest nurse station not more than 30m
	patient bay	cognitive	8		1	the farthest patient bay doorway visible from at least one nurse station
	patient bay	physical	9		1	plastic or wooden strip fitted on walls at 400-700mm height above floor level, to prevent damage by movement of beds
	patient bay	physical	10		1	night table installed next to each bed
	patient bay	physical	11		1	night table can be accessed without moving bed
	patient bay	physical	12		1	cupboard installed for patient personal belongings
	patient bay	physical	13		1	cupboard can be opened without moving bed
	patient bay	physical	14		1	cupboard fitted with lockable valuables section
	patient bay	physical	15		1	lockable section of cupboard coin-operated (keys often get lost)
	patient bay	physical	16		0	suitcase locker on top of cupboard
	patient bay	physical	17		1	cupboard hinges allow cupboard doors to open at least 135 degree
	patient bay	physical	18		1	lockable staff cupboard for basic nursing materials, not medicines (zero, if not lockable)
	patient bay	physical	19		0	room door at least 1260 x 2130mm
	patient bay	physical	20		0	room door fitted with sound insulation
	patient bay	physical	21		1	door closing mechanism overhead
	patient bay	physical	22		1	service supply duct runs behind the beds
	patient bay	physical	23		1	oxygen supply outlet within reach of each bed, without moving beds
	patient bay	physical	24		1	vacuum line installed in duct
	patient bay	physical	25		1	compressed air sockets within reach of each bed, without moving beds
	patient bay	physical	26		1	extra power points, unused, for movable equipment
	patient bay	physical	27		1	power points for patient use fitted, within reach of each bed, without moving beds
	patient bay	physical	28		0	reading lights for patient use installed, within reach of each bed, without moving beds
	patient bay	physical	29		1	emergency buzzer installed, within reach of each bed without moving beds
	patient bay	physical	30		1	all power cables and outlets are housed in the duct
	patient bay	physical	31		1	washbasin installed
	patient bay	physical	32		0	WC installed
	patient bay	physical	33		1	washbasin not more than 860mm from floor, to allow access by wheelchair users
	patient bay	physical	34		1	adequate leg space underneath washbasin to enhance access by wheelchair users
	patient bay	universal	35		0	en suite accessible shower or bathroom installed

	patient bay	universal	36		0	a table (900 x 900mm for four patients) installed with a chair for each patient
	patient bay	physical	37		1	patient bed height adjustable electronically
	patient bay	physical	38		1	no trailing cords, wires or tubes
	patient bay	universal	39		1	rooms not overlooked by pedestrian route closer than 22m
	patient bay	physical	40		1	floor surface, seamless, slip-free and glare-free
	patient bay	physical	41		1	flooring adequately maintained
	patient bay	physical	42		0	floor and wall intersection coved to prevent dirt building up on floor corners
	patient bay	sensory	43		0	view of nurse station from at least one patient bed
	patient bay	cognitive	44		1	view of corridor activities (within ward) from all patient beds
	patient bay	sensory	45		1	natural daylight adequate without use of artificial lighting
	patient bay	sensory	46		1	light level satisfactory (ample, no glare)
	patient bay	cognitive	47		1	dark at night, or alternative blind mechanism installed
	patient bay	sensory	48		0	reading lights for patient use installed, within reach of each bed, controllable by patient, without moving beds
	patient bay	universal	49		1	temperature satisfactory
	patient bay	sensory	50		1	sound level satisfactory
	patient bay	sensory	51		1	window installed, glazed
	patient bay	sensory	52		1	air quality satisfactory (not stuffy or draughty)
	patient bay	sensory	53		1	natural air ventilation through window
	patient bay	universal	54		1	observed air movement
	patient bay	sensory	55		1	absence of unpleasant smell
	patient bay	cognitive	56		1	absence of conflicting sounds
	patient bay	cognitive	57		1	call system not disturbing at night
	patient bay	cognitive	58		1	patient bay door signage
	patient bay	cognitive	59		1	view of outside human activities from all patient beds
	patient bay	physical	60		1	accessible door fitted
	patient bay	cognitive	61		1	accessible doors fitted with signage to facilitate space identification and wayfinding
	patient bay	physical	62		1	accessible doors fitted with a door handle
	patient bay	physical	63		1	accessible doors fitted with an extra pull handle
	patient bay	sensory	64		1	accessible doors fitted with glazing a window
	patient bay	physical	65		1	accessible doors fitted with a kick plate
	patient bay	physical	66		1	kick plates between 0.30m and 0.40m in height
	patient bay	physical	67		0	door handles are lever-type handles, push plates or pull handles on swinging doors
	patient bay	physical	68		0	door handles located at a comfortable height between 0.90m and 1.00m from the floor surface
	patient bay	physical	69		1	round knobs are avoided
	patient bay	physical	70		1	doors with spring closers equipped with an extra pull handle approximately 0.30m in length
	patient bay	physical	71		0	doors with spring closers have extra pull handle mounted between 0.90m and 1.20m from the floor
	patient bay	physical	72		1	accessible door permits operation by one person, in a single motion, with one hand and with little effort
	patient bay	physical	73		1	for double-leaf doors, at least one leaf has a minimum clear width of 0.80m
	patient bay	physical	74		1	threshold avoided
	patient bay	cognitive	75		1	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	patient bay	cognitive	76		1	room numbers placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open

	patient bay	cognitive	77		0	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
	patient bay	cognitive	78		0	glazed doors clearly marked with a coloured band or mark placed at a height between 1.40m and 1.60m
		two-third rule:	89.66%	78.21%	61	

Appendix WC-WE03

Ward Environment Assessment Tool

Ward C – Side Room

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE03	side room	universal	1		1	at least two side rooms provided
	side room	universal	2		1	no shared side rooms
	side room	physical	3		0	distance from the closest nurse station not more than 20m
	side room	sensory	4		0	if side room more than 20m from the closest nurse station, patient bed visible from at least one nurse station
	side room	universal	5		0	minimum room size 20.0m square
	side room	universal	6		0	patient control of ventilation: window or air conditioning can be operated by wheelchair or bed-confined persons (zero if shared)
	side room	universal	7		0	patient control of lighting, other than main switch by door (zero if shared)
	side room	universal	8		0	chairs not wipeclean or plastic fabric
	side room	universal	9		0	en suite bathroom installed
	side room	universal	10		1	en suite wc installed
	side room	universal	11		1	en suite washbasin installed
	side room	universal	12		1	adequate clothes storage provided
	side room	physical	13		1	emergency access to en suite: door opens out to avoid fallen patient becoming trapped
	side room	physical	14		1	emergency release of lock of en suite door from inside room, e.g. with key or coin
	side room	universal	15		1	emergency buzzer installed
	side room	universal	16		1	provision of TV in room
	side room	universal	17		1	layout allows sitting space for visitors
	side room	physical	18		0	clear bed space at least 3.6 m wide and 3.7 m deep
	side room	physical	19		1	at least 1.5m space for wheelchair manoeuvre
	side room	physical	20		0	at least 1.5m around each side of the length of patient bed
	side room	physical	21		0	at least 1.3m at the leg end of each patient bed
	side room	physical	22		1	patient bed height adjustable electronically
	side room	physical	23		1	wheelchair access to opening side of en suite door: min. 30cm wall width
	side room	physical	24		0	space for nursing staff at each side of fittings in en suite
	side room	physical	25		0	padded backrest on en suite wc
	side room	physical	26		0	ergonomic fittings in en suite (flush is lever, large and smooth to hold; taps cross-top or lever)
	side room	sensory	27		1	en suite bathroom with means of removing smell (extractor or window)
	side room	physical	28		1	en suite bathroom/wc fulfils accessible requirements under bathroom and wc
	side room	universal	29		0	en suite bathroom/wc with shaver point
	side room	physical	30		0	no trailing cords, wires or tubes
	side room	physical	31		1	secure handrail by washbasin and wc if provided
	side room	physical	32		1	no clash of room and en suite doors
	side room	universal	33		1	soap dispenser and hand dryer/paper towel

	side room	universal	34		1	no unprotected heater or exposed hot pipes
	side room	universal	35		1	plastic or wooden strip fitted on walls at 400-700mm height above floor level, to prevent damage by movement of beds
	side room	universal	36		1	emergency buzzer allows for different room layouts without trailing cords
	side room	universal	37		0	lockable storage space
	side room	physical	38		1	floor surface, seamless, slip-free and glare-free
	side room	universal	39		1	flooring adequately maintained
	side room	universal	40		1	floor and wall intersection coved to prevent dirt building up on floor corners
	side room	sensory	41		0	day room doorway visible from side room threshold
	side room	sensory	42		0	at least one nurse station visible from side room threshold
	side room	cognitive	43		1	side room door glazed with blind and on-looking corridor or circulation area
	side room	cognitive	44		0	view of activities within building but outside day room from patient bed (e.g.. view of circulation space through glazed door window)
	side room	cognitive	45		0	view of corridor activities (within ward) from patient bed
	side room	cognitive	46		1	view of outside human activities (e.g. roads, shops)
	side room	cognitive	47		1	view of natural landscape or garden
	side room	sensory	48		1	dark at night, or alternative blind mechanism installed
	side room	sensory	49		1	natural daylight adequate without use of artificial lighting
	side room	sensory	50		1	light level satisfactory (ample, no glare)
	side room	sensory	51		1	reading lights for patient use installed, within reach of each bed, controllable by patient, without moving beds
	side room	universal	52		0	patient control of heating (zero if shared)
	side room	universal	53		1	stable heating in room
	side room	universal	54		1	temperature satisfactory
	side room	sensory	55		1	sound level satisfactory
	side room	sensory	56		1	window installed, glazed
	side room	sensory	57		1	natural air ventilation through window
	side room	universal	58		1	air quality satisfactory (not stuffy or draughty)
	side room	universal	59		1	observed air movement
	side room	sensory	60		1	absence of unpleasant smell
	side room	cognitive	61		1	absence of conflicting sound sources
	side room	cognitive	62		1	absence of distressing sounds
	side room	sensory	63		1	acoustic privacy (zero if room shared)
	side room	cognitive	64		1	call system not disturbing at night
	side room	physical	65		1	entrance door accessible
	side room	universal	66		0	entrance door lockable from inside
	side room	cognitive	67		1	accessible door fitted with signage to facilitate space identification and wayfinding
	side room	physical	68		1	accessible door fitted with a door handle
	side room	physical	69		0	accessible door fitted with an extra pull handle
	side room	sensory	70		1	accessible door fitted with a glazed window
	side room	physical	71		1	accessible doors fitted with a kick plate
	side room	physical	72		1	kick plates between 0.30m and 0.40m in height
	side room	physical	73		0	door handles are lever-type handles, push plates or pull handles on swinging doors
	side room	physical	74		0	door with spring closers equipped with an extra pull handle approximately 0.30m in length
	side room	physical	75		1	accessible doors permits operation by one person, in a single motion, with one hand and with little effort
	side room	physical	76		1	the minimum opening is at least 0.80m when the door is open
	side room	physical	77		1	for double-leaf doors, at least one leaf has a minimum clear width of 0.80m

	side room	physical	78		1	threshold avoided
	side room	universal	79		1	en suite door opens out with at least 1.2m clear space to avoid fallen patient becoming trapped
	side room	universal	80		1	emergency release of lock of en suite door from inside room, e.g. with key or coin
	side room	cognitive	81		1	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	side room	cognitive	82		0	room number placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	side room	cognitive	83		1	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
	side room	cognitive	84		0	glazed door clearly marked with a coloured band or mark placed at a height between 1.40m and 1.60m
		two-third rule:	93.33%	67.86%	57	

Appendix WC-WE04

Ward Environment Assessment Tool

Ward C – Staff Room

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE04	staff room	universal	1		1	staff room provided
	staff room	universal	2		1	away from patient bays to facilitate recreation and complete disconnection from ward activities
	staff room	universal	3		0	separate staff bath/shower
	staff room	universal	4		1	separate staff wc
	staff room	universal	5		1	changing room provided
	staff room	universal	6		0	changing room offer gender choices
	staff room	universal	7		1	lockable lockers for each member of staff
	staff room	universal	8		0	dining table for at least one-third of staffing level
	staff room	universal	9		0	dining chairs for at least one-third of staffing level
	staff room	universal	10		1	smoke-free area for eating separately from smokers
	staff room	physical	11		1	floor carpeted, seamless, slip-free and glare-free
	staff room	universal	12		1	flooring adequately maintained
	staff room	universal	13		0	floor and wall intersection coved to prevent dirt building up on floor corners
	staff room	universal	14		0	staff room with comfortable chairs for one-third number of staffing level
	staff room	sensory	15		0	natural daylight adequate without use of artificial lighting (ample, no glare)
	staff room	universal	16		1	temperature satisfactory
	staff room	sensory	17		1	sound level satisfactory
	staff room	sensory	18		0	natural air ventilation through window
	staff room	universal	19		1	air quality satisfactory (not stuffy or draughty)
	staff room	sensory	20		1	absence of unpleasant smell
	staff room	universal	21		1	observed air movement
	staff room	cognitive	22		1	absence of conflicting sounds
	staff room	universal	23		1	access door passcode protected
	staff room	cognitive	24		1	access door fitted with signage to facilitate space identification and wayfinding
	staff room	physical	25		1	access door fitted with a door handle
	staff room	physical	26		1	access door fitted with an extra pull handle
	staff room	physical	27		1	access door fitted with a kick plate

	staff room	physical	28		1	kick plates between 0.30m and 0.40m in height
	staff room	physical	29		0	access door handles are lever-type handles, push plates or pull handles on swinging doors
	staff room	physical	30		1	access door handles located at a comfortable height between 0.90m and 1.00m from the floor surface
	staff room	physical	31		1	round knobs are avoided
	staff room	physical	32		1	access door with spring closers equipped with an extra pull handle approximately 0.30m in length
	staff room	physical	33		1	access door with spring closers have extra pull handle mounted between 0.90m and 1.20m from the floor
	staff room	physical	34		1	access door permit operation by one person, in a single motion, with one hand and with little effort
	staff room	physical	35		1	the minimum opening is at least 0.80m when the door is open
	staff room	physical	36		1	threshold avoided
	staff room	cognitive	37		1	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	staff room	cognitive	38		0	room numbers placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	staff room	cognitive	39		0	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	95.12%	71.79%	28	

Appendix WC-WE05

Ward Environment Assessment Tool
Ward C – Ward Manager's Office

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE05	ward manager's office	universal	1		1	separate ward manager's office provided
	ward manager's office	universal	2		1	accommodates at least four other people seated for short meetings
	ward manager's office	physical	3		1	floor carpeted, seamless, slip-free and glare-free
	ward manager's office	universal	4		1	flooring adequately maintained
	ward manager's office	universal	5		0	floor and wall intersection coved to prevent dirt building up on floor corners
	ward manager's office	cognitive	6		1	telephone installed for quick contact with nurse station or other multidisciplinary team members
	ward manager's office	cognitive	7		1	stationery and writing materials for note taking
	ward manager's office	cognitive	8		0	acoustic insulation to reduce noise intrusion
	ward manager's office	universal	9		0	natural air ventilation through window
	ward manager's office	sensory	10		0	natural daylight adequate without use of artificial lighting (ample, no glare)
	ward manager's office	sensory	11		0	ambient lighting fitted on desktop
	ward manager's office	sensory	12		1	temperature satisfactory
	ward manager's office	sensory	13		1	sound level satisfactory
	ward manager's office	universal	14		1	air quality satisfactory (not stuffy or draughty)

	ward manager's office	sensory	15		1	observed air movement
	ward manager's office	sensory	16		1	absent of unpleasant smell
	ward manager's office	sensory	17		1	absent of conflicting sounds
	ward manager's office	physical	18		1	access door fitted, not open access
	ward manager's office	universal	19		1	access door lockable from outside or passcode protected
	ward manager's office	physical	20		1	access door lockable from inside
	ward manager's office	physical	21		1	access door fitted with signage to facilitate space identification and wayfinding
	ward manager's office	physical	22		1	access door fitted with a door handle
	ward manager's office	physical	23		0	access door fitted with an extra pull handle
	ward manager's office	sensory	24		0	access door fitted with a glazed window
	ward manager's office	physical	25		1	access door fitted with a kick plate
	ward manager's office	physical	26		1	access door kick plates between 0.30m and 0.40m in height
	ward manager's office	physical	27		1	access door handles are lever-type handles, push plates or pull handles on swinging doors
	ward manager's office	physical	28		1	access door handles located at a comfortable height between 0.90m and 1.00m from the floor surface
	ward manager's office	physical	29		1	round knobs are avoided
	ward manager's office	physical	30		1	access door permits operation by one person, in a single motion, with one hand and with little effort
	ward manager's office	physical	31		1	access door minimum opening is at least 0.80m when the door is open
	ward manager's office	physical	32		1	threshold avoided
	ward manager's office	cognitive	33		1	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	ward manager's office	cognitive	34		0	room numbers placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	ward manager's office	cognitive	35		1	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	89.74%	77.14%	27	

Appendix WC-WE06

Ward Environment Assessment Tool

Ward C – Doctor's Office

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE06	doctor's office	universal	1		1	separate doctor's office provided
	doctor's office	universal	2		1	accommodates at least four other people seated for short meetings

	doctor's office	physical	3		1	floor carpeted, seamless, slip-free and glare-free
	doctor's office	universal	4		1	flooring adequately maintained
	doctor's office	physical	5		0	floor and wall intersection curved to prevent dirt building up on floor corners
	doctor's office	universal	6		1	telephone installed for quick contact with nurse station or other multidisciplinary team members
	doctor's office	cognitive	7		1	stationery and writing materials for note taking
	doctor's office	cognitive	8		0	acoustic insulation to reduce noise intrusion
	doctor's office	sensory	9		0	natural air ventilation through window
	doctor's office	sensory	10		0	natural daylight adequate without use of artificial lighting (ample, no glare)
	doctor's office	sensory	11		0	ambient lighting fitted on desktop
	doctor's office	universal	12		1	temperature satisfactory
	doctor's office	sensory	13		1	sound level satisfactory
	doctor's office	universal	14		1	air quality satisfactory (not stuffy or draughty)
	doctor's office	universal	15		1	observed air movement
	doctor's office	sensory	16		1	absent of unpleasant smell
	doctor's office	cognitive	17		1	absent of conflicting sounds
	doctor's office	sensory	18		1	access door lockable from outside or passcode protected
	doctor's office	universal	19		1	access door lockable from inside
	doctor's office	cognitive	20		1	access door fitted with signage to facilitate space identification and wayfinding
	doctor's office	physical	21		0	access door fitted with a door handle
	doctor's office	physical	22		0	access door fitted with an extra pull handle
	doctor's office	physical	23		1	access door fitted with a kick plate
	doctor's office	physical	24		1	access door kick plates between 0.30m and 0.40m in height
	doctor's office	physical	25		1	access door permits operation by one person, in a single motion, with one hand and with little effort
	doctor's office	physical	26		1	access door minimum opening is at least 0.80m when the door is open
	doctor's office	physical	27		1	for double-leaf entrance door, at least one leaf has a minimum clear width of 0.80m
	doctor's office	physical	28		1	threshold avoided
	doctor's office	cognitive	29		1	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	doctor's office	cognitive	30		0	room numbers placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	doctor's office	cognitive	31		1	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	83.78%	74.19%	23	

Appendix WC-WE07

Ward Environment Assessment Tool

Ward C – Day Room

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE07	day room	universal	1		0	day room provided
	day room	universal	2		1	room not through passageway to other parts of ward area

	day room	universal	3		1	external windows secured against intrusion
	day room	universal	4		0	windows with blinds for privacy, e.g.. for patient-family discussions
	day room	universal	5		1	room large enough for family gatherings
	day room	universal	6		0	TV installed for patient use
	day room	universal	7		0	choice of location for daytime activities
	day room	universal	8		0	adequate space for special support seating: at least two groups of patient-family discussions can take place simultaneously
	day room	universal	9		1	floor carpeted, slip-free and glare-free
	day room	universal	10		1	flooring adequately maintained
	day room	universal	11		0	floor and wall intersection coved to prevent dirt building up on floor corners
	day room	physical	12		0	at least 1.3m turning space for wheelchair
	day room	universal	13		0	various styles of chairs and settees
	day room	universal	14		1	chairs not wipe clean or plastic fabric
	day room	physical	15		1	tables or writing desks accessible by wheelchair users
	day room	universal	16		1	no unprotected heaters or exposed hot pipes
	day room	physical	17		0	doorway accessible by wheelchair users
	day room	physical	18		1	doorway accessible by independent patients using mobility devices, e.g. walking frames
	day room	cognitive	19		0	design is homelike, emulates domestic environment
	day room	cognitive	20		0	dayroom recognisable by its function
	day room	cognitive	21		0	signage on door to aid patient wayfinding
	day room	cognitive	22		0	signage in room to aid patient orientation
	day room	sensory	23		0	glazed window in access door to day room
	day room	sensory	24		0	doorway or room traffic visible from at least one nursing station
	day room	universal	25		0	room equipped with small lamps for individual activities (e.g. reading)
	day room	sensory	26		0	acoustic privacy, e.g. sound absorbent surfaces
	day room	universal	27		1	natural air ventilation through window
	day room	sensory	28		0	natural daylight adequate without use of artificial lighting (ample, no glare)
	day room	sensory	29		1	light level satisfactory (ample, no glare)
	day room	universal	30		1	temperature satisfactory
	day room	sensory	31		1	sound level satisfactory
	day room	universal	32		0	no wc door immediately opposite day room
	day room	universal	33		1	air quality satisfactory (not stuffy or draughty)
	day room	universal	34		1	observed air movement
	day room	sensory	35		1	absence of unpleasant smell
	day room	cognitive	36		1	absence of conflicting sound sources
	day room	universal	37		1	call system not disturbing at night
	day room	cognitive	38		0	maximum windowsill height 600mm
	day room	cognitive	39		0	view of outside human activities (e.g. roads, shops)
	day room	cognitive	40		0	view of natural landscape or garden
	day room	cognitive	41		0	view of activities within building but outside day room (e.g. view of circulation spaces through internal window)
	day room	universal	42		0	variation in temperature within room
	day room	cognitive	43		1	access door fitted with signage to facilitate space identification and wayfinding
	day room	physical	44		0	access door fitted with a door handle
	day room	physical	45		0	access door fitted with an extra pull handle
	day room	sensory	46		0	access door fitted with a glazed window
	day room	physical	47		1	access door fitted with a kick plate

	day room	physical	48		1	access door kick plates between 0.30m and 0.40m in height
	day room	physical	49		1	round knobs are avoided
	day room	physical	50		0	access door with spring closers equipped with an extra pull handle approximately 0.30m in length
	day room	physical	51		0	access door with spring closer has extra pull handle mounted between 0.90m and 1.20m from the floor
	day room	physical	52		1	access door permits operation by one person, in a single motion, with one hand and with little effort
	day room	physical	53		1	access door minimum opening is at least 0.80m when the door is open
	day room	physical	54		1	threshold avoided
	day room	cognitive	55		0	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	day room	cognitive	56		0	room numbers placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	day room	cognitive	57		1	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	93.44%	45.61%	26	

Appendix WC-WE08

Ward Environment Assessment Tool

Ward C – Corridor

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
	corridor	cognitive	1		1	corridor traffic visible from at least one nursing station
	corridor	universal	2		1	entrance area welcoming to visitors: reception and signposting
	corridor	universal	3		1	safeguards against unwanted visitors (e.g staffed reception area)
	corridor	sensory	4		0	offers direct visual path between main entrance and reception or to at least one nurse station
	corridor	cognitive	5		1	signage to aid wayfinding and orientation
	corridor	cognitive	6		1	noticeboard with information for visitors
	corridor	cognitive	7		0	colour-coding to aid spatial differentiation of ward elements opening from corridor
	corridor	cognitive	8		0	external reference views visible from corridor (visible landmarks that assist indoor orientation, e.g. roads, buildings)
	corridor	universal	9		0	emergency buzzer points at intervals of 10m throughout corridors
	corridor	universal	10		1	unrestricted access for ambulant and independent patients
WE08	corridor	physical	11		1	unrestricted through access by wheelchair users
	corridor	physical	12		1	unrestricted through access by ambulant patients using mobility devices (e.g. zimmer frames)
	corridor	cognitive	13		1	all patient-accessible spaces easy to supervise by nursing staff
	corridor	physical	14		1	all patient-accessible spaces easy to access
	corridor	universal	15		0	staff photographs on display
	corridor	physical	16		0	public telephone facilities at suitable heights for wheelchair users
	corridor	physical	17		0	at least 2.5m wide for patient transport on beds and trolleys
	corridor	physical	18		0	effective width not constricted by projections, columns, or other building elements
	corridor	physical	19		1	suspended corridor ceiling not less than 2.4m high
	corridor	physical	20		1	to facilitate use by ambulant disabled and elderly people, handrails mounted between 0.85m and 0.95m above the finished floor level
	corridor	physical	21		0	for the benefit of wheelchair users, a second handrail mounted between 0.70m and 0.75m from the finished floor level

	corridor	physical	22		1	handrails continue uninterrupted (except for doorways) on both sides of the corridor
	corridor	physical	23		1	for wall-mounted handrails, the space between the handrail and the wall should be between 40mm and 50mm for smooth walls and 60mm for rough textured walls
	corridor	physical	24		1	handrails have no snag ends
	corridor	physical	25		1	floor surfaces, seamless, non-slip and even
	corridor	physical	26		1	flooring securely fastened
	corridor	physical	27		1	no thresholds or steps on corridors
	corridor	universal	28		0	floor and wall intersection coved to prevent dirt building up on floor corners
	corridor	physical	29		1	all ward spaces accessible from corridor without steps
	corridor	physical	30		1	all ward spaces accessible with zero gradient, or slope not more than 1.3 degree
	corridor	universal	31		0	resting area on routes from patient bays to day room
	corridor	universal	32		1	no unprotected heaters or exposed hot pipes
	corridor	universal	33		1	plastic or wooden strip fitted on walls at 400-700mm height above floor level, to prevent damage by movement of beds
	corridor	physical	34		1	at least one patient wc accessible from corridor by wheelchair users
	corridor	physical	35		1	at least one visitor wc accessible from corridor by wheelchair users
	corridor	physical	36		1	door handles are lever with return
	corridor	physical	37		1	door closers to day room, bathroom, wc, are hold-open or free-swing
	corridor	cognitive	38		1	visual contrast between fittings (handrails, door handles, switches) and background
	corridor	universal	39		1	no barriers e.g. fire doors, without hold-open
	corridor	physical	40		0	no other observed barriers
	corridor	cognitive	41		1	absence of distracting or confusing background noise from medical equipment
	corridor	cognitive	42		0	corridor has view of outside human activities (e.g.. roads, shops)
	corridor	sensory	43		0	corridor has exterior window or other form of natural light
	corridor	sensory	44		0	windows for lighting and ventilation not further than 8m apart
	corridor	sensory	45		0	adequate natural light
	corridor	sensory	46		1	light level satisfactory (ample, no glare)
	corridor	universal	47		1	temperature satisfactory
	corridor	sensory	48		1	sound level satisfactory
	corridor	sensory	49		1	air quality satisfactory (not stuffy or draughty)
	corridor	universal	50		1	observed air movement
	corridor	sensory	51		1	absence of unpleasant smell
	corridor	cognitive	52		1	absence of conflicting other sounds
	corridor	cognitive	53		1	call system not disturbing at night
	corridor	sensory	54		0	patient accessible telephone
	corridor	sensory	55		0	intentionally brighter lighting at corners and transitions
		two-third rule:	96.49%	67.27%	37	

Appendix WC-WE09

Ward Environment Assessment Tool

Ward C – Storage Room

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORES	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE09	storage room	universal	1		0	space for wheelchairs equivalent to number of patient beds

	storage room	universal	2		0	space to store at least one mobile hoist
	storage room	universal	3		0	space to store mobility devices (e.g.. zimmer frames)
	storage room	universal	4		1	space to store linens and supplies
	storage room	sensory	5		0	natural daylight adequate without use of artificial lighting (ample, no glare)
	storage room	sensory	6		0	ambient lighting fitted for worktop
	storage room	universal	7		1	temperature satisfactory
	storage room	sensory	8		1	sound level satisfactory
	storage room	universal	9		0	air ventilator or window installed
	storage room	universal	10		1	air quality satisfactory (not stuffy or draughty)
	storage room	universal	11		1	observed air movement
	storage room	sensory	12		1	absence of unpleasant smell
	storage room	cognitive	13		1	absence of conflicting sounds
	storage room	cognitive	14		0	item spaces colour-coded for easy identification
	storage room	cognitive	15		1	access door fitted with signage to facilitate space identification and wayfinding
	storage room	physical	16		1	access door fitted with a door handle
	storage room	physical	17		0	access door fitted with an extra pull handle
	storage room	sensory	18		0	access door fitted with a glazed window
	storage room	physical	19		1	access door fitted with a kick plate
	storage room	physical	20		1	access door kick plates between 0.30m and 0.40m in height
	storage room	physical	21		0	access door handles are lever-type handles, push plates or pull handles on swinging doors
	storage room	physical	22		1	access door handles located at a comfortable height between 0.90m and 1.00m from the floor surface
	storage room	physical	23		1	round knobs are avoided
	storage room	physical	24		0	access door with spring closers equipped with an extra pull handle approximately 0.30m in length
	storage room	physical	25		1	access door permits operation by one person, in a single motion, with one hand and with little effort
	storage room	physical	26		1	access door minimum opening is at least 0.80m when the door is open
	storage room	physical	27		1	threshold avoided
	storage room	cognitive	28		1	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	storage room	cognitive	29		0	room numbers placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	storage room	cognitive	30		1	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	90.91%	60.00%	18	

Appendix WC-WE10

Ward Environment Assessment Tool

Ward C – Clean Utility

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE10	clean utility	universal	1		1	hand wash basin installed
	clean utility	universal	2		1	soap dispenser and hand towels facilities installed
	clean utility	universal	3		1	pharmacy return skip installed

	clean utility	universal	4		1	segregated waste disposal skips installed
	clean utility	universal	5		1	separate skip for medical wastes (syringes and cannulas and waste medicines)
	clean utility	cognitive	6		1	at least 120 x 60 cm worktop for medicine preparation, calculation and related documentation
	clean utility	universal	7		1	worktop surfaces covered with infection resistant finishing
	clean utility	sensory	8		1	worktop surfaces free of glare and reflection
	clean utility	cognitive	9		1	medicine cabinets labelled
	clean utility	cognitive	10		0	medicine cabinets colour coded
	clean utility	universal	11		0	disposable gloves provided
	clean utility	physical	12		1	floor surface, slip-free and glare-free
	clean utility	universal	13		1	flooring adequately maintained
	clean utility	universal	14		0	floor and wall intersection coved to prevent dirt building up on floor corners
	clean utility	physical	15		1	sufficient floor space to accommodate at least two members of staff
	clean utility	cognitive	16		0	network computer provided for quick access to medicines and pharmaceutical instructions
	clean utility	cognitive	17		0	telephone installed for quick contact with nurse station or to consult other multidisciplinary team members
	clean utility	cognitive	18		0	stationery and writing materials for note taking
	clean utility	cognitive	19		0	acoustic insulation to reduce noise intrusion
	clean utility	sensory	20		0	natural daylight adequate without use of artificial lighting (ample, no glare)
	clean utility	sensory	21		0	ambient lighting fitted for worktop
	clean utility	universal	22		1	temperature satisfactory
	clean utility	sensory	23		1	sound level satisfactory
	clean utility	sensory	24		1	air quality satisfactory (not stuffy or draughty)
	clean utility	sensory	25		1	observed air movement
	clean utility	sensory	26		1	absence of unpleasant smell
	clean utility	cognitive	27		1	absence of conflicting sounds
	clean utility	physical	28		1	access door passcode protected
	clean utility	cognitive	29		0	access door with turn on/off signage to indicate medication calculation in progress
	clean utility	physical	30		1	access door with spring closes without extra effort
	clean utility	cognitive	31		1	access door fitted with signage to facilitate space identification and wayfinding
	clean utility	physical	32		0	access door fitted with a door handle
	clean utility	physical	33		0	access door fitted with an extra pull handle
	clean utility	sensory	34		1	access door fitted with a glazed window with blind mechanism
	clean utility	physical	35		1	access door fitted with a kick plate
	clean utility	physical	36		1	access door kick plates between 0.30m and 0.40m in height
	clean utility	physical	37		0	access door with spring closers equipped with an extra pull handle approximately 0.30m in length
	clean utility	physical	38		0	access door with spring closer has extra pull handle mounted between 0.90m and 1.20m from the floor
	clean utility	physical	39		1	access door permits operation by one person, in a single motion, with one hand and with little effort
	clean utility	physical	40		1	access door minimum opening is at least 0.80m when the door is open
	clean utility	physical	41		1	for double-leaf entrance door, at least one leaf has a minimum clear width of 0.80m
	clean utility	physical	42		1	threshold avoided
	clean utility	cognitive	43		1	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	clean utility	cognitive	44		0	room numbers placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	clean utility	cognitive	45		0	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments

		two-third rule:	91.84%	64.44%	29	

Appendix WC-WE11

Ward Environment Assessment Tool

Ward C – Sluice

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE11	sluice	physical	1		1	sluice not more than 30m from the farthest patient room
	sluice	universal	2		0	sluice walls tiled or covered with infection resistant finishing
	sluice	sensory	3		1	means of removing smell (extractor or window) from sluice
	sluice	universal	4		1	different types of waste adequately segregated by skip type and/or colour coded
	sluice	sensory	5		1	waste containers/skips fitted with lids to prevent odours escaping
	sluice	sensory	6		0	access door lockable from outside or passcode protected
	sluice	sensory	7		1	access door spring closes automatically to prevent odour escaping
	sluice	cognitive	8		1	access door fitted with signage to facilitate space identification and wayfinding
	sluice	physical	9		1	access door fitted with a door handle
	sluice	physical	10		0	access door fitted with an extra pull handle
	sluice	sensory	11		0	access door fitted with a glazed window
	sluice	physical	12		1	access door fitted with a kick plate
	sluice	physical	13		1	access door kick plates between 0.30m and 0.40m in height
	sluice	physical	14		1	access door handles located at a comfortable height between 0.90m and 1.00m from the floor surface
	sluice	physical	15		1	round knobs are avoided
	sluice	physical	16		1	access door permits operation by one person, in a single motion, with one hand and with little effort
	sluice	physical	17		1	access door minimum opening at least 0.80m when the door is open
	sluice	physical	18		1	threshold avoided
	sluice	cognitive	19		1	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	sluice	cognitive	20		0	room number placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	sluice	cognitive	21		0	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	95.45%	71.43%	15	

Appendix WC-WE12

Ward Environment Assessment Tool

Ward C – Bathroom & WC

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE12	bathroom & wc	universal	1		1	medical fittings are discreet in bathrooms and wcs
	bathroom & wc	physical	2		1	at least one wc has enough space for a patient and the carer inside with door shut
	bathroom & wc	universal	3		0	no grouped wc separated only by partition
	bathroom & wc	physical	4		0	bathroom contains a wc (not commode)

	bathroom & wc	physical	5		1	wheelchair accessible bathroom & wc
	bathroom & wc	physical	6		1	wc allows at least 1.5m in diameter for full 360 degree manoeuvring of wheelchair
	bathroom & wc	universal	7		0	storage/display space for personal items
	bathroom & wc	universal	8		0	access door lockable from inside
	bathroom & wc	universal	9		0	bathroom/wc with fittings (bath, wc, washbasins) not visible from open door
	bathroom & wc	universal	10		1	visual privacy within bathroom from nursing staff, e.g. alcove or screen
	bathroom & wc	universal	11		1	emergency access: door opens out with at least 1.2m clear space to avoid fallen patient becoming trapped
	bathroom & wc	universal	12		1	emergency release of lock from outside, e.g. with key or coin
	bathroom & wc	universal	13		1	emergency buzzer installed
	bathroom & wc	universal	14		1	separate visitor wc on corridor/circulating areas
	bathroom & wc	physical	15		1	pivoted doors open outward
	bathroom & wc	physical	16		1	a handle placed on the door from the inside to facilitate closing
	bathroom & wc	physical	17		1	another handle placed on door outside
	bathroom & wc	physical	18		1	operational devices on doors, such as handles, pulls, latches and locks, easy to grasp with one hand
	bathroom & wc	physical	19		1	handrails installed in wc, bathtub and shower to assist disabled persons to use the facilities safely and easily
	bathroom & wc	physical	20		1	handrails have a diameter of 30mm to 40mm
	bathroom & wc	physical	21		1	handrails firmly fixed with stand loads and have non-slip surfaces
	bathroom & wc	physical	22		0	mirrors suitable for use by both standing and seated persons
	bathroom & wc	physical	23		1	single-lever mixing-type taps or push-buttons taps easily operable by hand or elbow
	bathroom & wc	physical	24		1	clearance between the grip of the tap and any adjacent vertical surface not less than 35mm
	bathroom & wc	universal	25		0	telephone fixtures with a cord at least 1.50m long are installed
	bathroom & wc	physical	26		1	no doorsteps installed
	bathroom & wc	physical	27		1	no slope, except for drainage
	bathroom & wc	physical	28		1	threshold avoided
	bathroom & wc	physical	29		1	flooring materials slip-proof
	bathroom & wc	physical	30		1	flooring materials easy to clean
	bathroom & wc	physical	31		1	floor well-drained and provided with adequate waterproofing
	bathroom & wc	physical	32		1	pipes fitted in the wall
	bathroom & wc	universal	33		0	choice of bath or shower
	bathroom & wc	physical	34		0	at least one bathroom with equipment for assisted bathing
	bathroom & wc	physical	35		0	at least one bathtub with integral sitting area at non-tap end
	bathroom & wc	physical	36		1	at least one bathroom with shower for wheelchair access
	bathroom & wc	physical	37		0	drain openings in shower is placed in a corner of the stall so that slip-resistant rubber mats can be used
	bathroom & wc	physical	38		1	shower dimensions are at least 2.4m by 1.5m and allow 1.5m diameter for full 360 degree manoeuvring of wheelchair
	bathroom & wc	physical	39		1	floor of the shower stall not more than 20mm below the level of the surrounding floor area
	bathroom & wc	physical	40		1	shower stall with a beveled threshold not exceeding 13mm above the finished floor
	bathroom & wc	physical	41		0	shower seat conveniently positioned for the shower head at a height between 0.45m and 0.50m
	bathroom & wc	physical	42		1	toilet seats, bidets, shower seats and bath-tub seat mounted at the same height of the wheelchair seat, i.e. between 0.45m and 0.50 m above floor level.
	bathroom & wc	physical	43		1	handrail placed on the wall opposite the shower seat and mounted at a height between 0.85m and 0.95m
	bathroom & wc	physical	44		1	wheelchair access to opening size of door: min 30cm wall width
	bathroom & wc	physical	45		1	at least 1.3m turning space for wheelchairs in bathrooms

	bathroom & wc	physical	46		0	fittings accessible by carer from each side
	bathroom & wc	physical	47		1	secure handrails to bath, wc, and washbasin, mounted at a height between 0.85 m and 0.95 m.
	bathroom & wc	physical	48		1	padded backrest on wc
	bathroom & wc	sensory	49		1	visual contrast between fittings and background
	bathroom & wc	physical	50		0	ergonomic fittings to bath, washbasins & wc (e.g. flush is lever, large & smooth to hold; taps are cross-top or lever)
	bathroom & wc	universal	51		0	bathroom has shaver point
	bathroom & wc	universal	52		0	all accessories, such as soap, towel, hand dryer and toilet paper dispensers are provided
	bathroom & wc	physical	53		0	all accessories, such as soap, towel, hand dryer and toilet paper dispensers are placed at a height between 0.50 m and 1.20 m from the finished floor level
	bathroom & wc	universal	54		0	at least one accessible urinal provided
	bathroom & wc	physical	55		0	lower edge of mirrors positioned at a height not exceeding 1.00m
	bathroom & wc	sensory	56		1	means of removing smell (extractor or window) in wc and bathroom with wcs
		two-third rule:	80.00%	66.07%	37	

Appendix WC-WE13

Ward Environment Assessment Tool

Ward C – Kitchen

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORES	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE13	kitchen	universal	1		0	annexed to nurse station
	kitchen	universal	2		1	if not annexed to nurse station, not farther than 25m metres from the farthest nurse stations
	kitchen	physical	3		1	at least 140 cm by 60cm clear worktop space for meal preparation
	kitchen	universal	4		0	vending machine for snacks, cold drinks
	kitchen	universal	5		1	microwave for meal heating
	kitchen	universal	6		1	refrigerator for cold meal storage
	kitchen	universal	7		1	water heating device to make hot drinks
	kitchen	universal	8		1	tea making machine provided
	kitchen	universal	9		1	coffee making machine provided
	kitchen	sensory	10		1	kitchen worktop free of glare and reflection
	kitchen	cognitive	11		1	acoustic insulation to reduce noise intrusion
	kitchen	sensory	12		0	natural daylight adequate without use of artificial lighting (ample, no glare)
	kitchen	sensory	13		0	ambient lighting fitted for worktop
	kitchen	universal	14		1	temperature satisfactory
	kitchen	sensory	15		1	sound level satisfactory
	kitchen	universal	16		1	air quality satisfactory (not stuffy or draughty)
	kitchen	universal	17		1	observed air movement
	kitchen	sensory	18		1	absence of unpleasant smell
	kitchen	cognitive	19		1	absence of conflicting sounds
	kitchen	universal	20		1	if not annexed to nurse station, access door lockable from outside or passcode protected
	kitchen	physical	21		1	access door spring closes automatically to prevent odour escaping
	kitchen	physical	22		1	access door fitted with signage to facilitate space identification and wayfinding
	kitchen	physical	23		1	access door fitted with a door handle
	kitchen	physical	24		1	access door fitted with an extra pull handle

	kitchen	sensory	25		1	access door fitted with a glazed window
	kitchen	physical	26		1	access door fitted with a kick plate
	kitchen	physical	27		1	access door kick plates between 0.30m and 0.40m in height
	kitchen	physical	28		1	access door handles located at a comfortable height between 0.90m and 1.00m from the floor surface
	kitchen	physical	29		1	round knobs are avoided
	kitchen	physical	30		1	access door permits operation by one person, in a single motion, with one hand and with little effort
	kitchen	physical	31		1	access door minimum opening at least 0.80m when the door is open
	kitchen	physical	32		1	threshold avoided
	kitchen	cognitive	33		1	room function and/or room number with international accessibility symbols placed on door at height between 1.40m and 1.60m
	kitchen	cognitive	34		0	room number placed on door frames or adjacent walls and not on doors themselves to be visible even when the door is open
	kitchen	cognitive	35		0	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	97.22%	82.86%	29	

Appendix WC-WE14

Ward Environment Assessment Tool

Ward C – Entrance & Exit

WARD ELEMENT CODE	WARD ELEMENT	PERSONAL CONSTRUCTS	NUMBER OF DESIGN FEATURE	PCI SCORE	RATING: Present (1) Absent (0) Not Applicable (n/a)	DESIGN FEATURE DESCRIPTION
WE14	entrances & exits	sensory	1		0	at least one entrance or exit visible from at least one nursing station
	entrances & exits	physical	2		1	no threshold
	entrances & exits	physical	3		1	kick plates between 0.30m and 0.40m in height
	entrances & exits	physical	4		1	doorway accessible by ambulant and independent patients
	entrances & exits	physical	5		1	doorway accessible by wheelchair users
	entrances & exits	physical	6		1	door accessible by ambulant patients using mobility devices (e.g. zimmer frames)
	entrances & exits	sensory	7		1	swinging doors on corridors have glazed low windows to enable users to see oncoming traffic
	entrances & exits	sensory	8		1	glazed doors clearly marked with a coloured band or mark placed at a height between 1.40m and 1.60m
	entrances & exits	sensory	9		1	bottom edge of the window on swinging corridor doors not higher than 1.00m from the finished floor level
	entrances & exits	cognitive	10		1	colour of the entrance door contrasts with the surrounding surface, to be distinguishable by people with sight problems
	entrances & exits	physical	11		0	handles are lever-type handles, push plates or pull handles on swinging doors
	entrances & exits	physical	12		1	operational devices on doors, such as handles, pulls, latches and locks, easy to grasp with one hand
	entrances & exits	physical	13		1	door handles located at a comfortable height between 0.90m and 1.00m from the floor surface
	entrances & exits	physical	14		1	round knobs are avoided
	entrances & exits	physical	15		1	doors with spring closers equipped with an extra pull handle approximately 0.30m in length
	entrances & exits	physical	16		0	doors with spring closers have extra pull handle located between 0.20m and 0.30m from the hinged side of door
	entrances & exits	physical	17		1	doors with spring closers have extra pull handle mounted between 0.90m and 1.20m from the floor
	entrances & exits	physical	18		1	pivoted doors swing away from the direction of travel
	entrances & exits	physical	19		1	accessible doors have the following features: a sign, a door handle, an extra pull handle, glazing and a kick plate
	entrances & exits	physical	20		1	entrance & exit doors permits operation by one person, in a single motion, with one hand and with little effort
	entrances	physical	21		0	vestibules avoided between two sets of doors

	& exits					
	entrances & exits	cognitive	22		1	signage to facilitate wayfinding
	entrances & exits	cognitive	23		1	contrast between door colour/door frame and adjoining walls facilitates visibility and identification by people with visual impairments
		two-third rule:	76.67%	82.61%	19	