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# A Grounded Theory examination of the factors that influence midwives when entering perinatal data: the theory of beneficial engagement

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**School of Nursing and Midwifery  
Faculty of Sciences, Medicine and Health**

**A Grounded Theory examination of the factors that influence  
midwives when entering perinatal data:  
The Theory of Beneficial Engagement**

**This thesis is submitted in (partial) fulfilment of the  
requirements for the award of the Degree of**

**DOCTOR OF PHILOSOPHY**

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**By**

**Alison Jane Craswell RN, BN, BA(Inf Mgmt), Grad Dip Mid**

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## ABSTRACT

Healthcare documentation, traditionally consisting of paper medical records, is being migrated to electronic records at increasing speed worldwide. The movement to paperless environments is believed to increase data accessibility and create savings in the tighter fiscal environments of modern healthcare. Population health data sets are collected to monitor mortality and morbidity, leading to identification of areas of most significant need and professional practice deficiency. Perinatal data collection is one such data set and is mandated for collection on all mothers and their babies born Australia-wide. Movement to computerised collection of perinatal data in Queensland, Australia, is proposed to have improved accuracy and decreased the turnaround time of the availability of this dataset. Midwives collect and enter perinatal data across Queensland, utilising eHealth technology.

This research aimed to understand the factors that influence midwives interaction with the computer when collecting and entering perinatal data. A Grounded Theory methodology was utilised and in-depth interviews were conducted with fifteen participants resulting in the development of a substantive theory, **The Theory of Beneficial Engagement**. This theory is grounded in the data, with a core category of **engagement** informed by nine elements: accountability, valuing, adapting, perceived benefits, workload, software, shifting focus, knowledge and data entry along with their subsequent themes.

The **Theory of Beneficial Engagement** proposes that midwives who enter perinatal data into a computer do so in the face of elements which act as barriers to successful use. However, data analysis identified elements particular to some participants that were not seemingly present in others. Some of these midwives appeared to effectively overcome barriers to entering perinatal data, hence forming a beneficial engagement with perinatal data. Such beneficial engagement emerged via participants personally identifying a reward for the effort of entering perinatal data into the computer. **The Theory of Beneficial Engagement** purports that the optimisation of any, some, or all of the elements of engagement in order to overcome barriers to perinatal data entry, may lead to achieving more timely, complete and accurate perinatal data entry. Translation of this theory proposes that any computer system can have an identified, individual set of elements that work to either enhance or act as barriers to engagement with particular software. Identification of these elements for any system and its group of users as well as their resulting modification to an optimal state, may lead to users becoming beneficially engaged with the software system. In this way, **The Theory of Beneficial Engagement** is translatable to any mandatory use software operated by users to achieve workplace goals.

This theory adds to the body of knowledge by being the first study to explain midwives use of computerised perinatal data collection in Queensland. Recommendations are suggested for improvement to the design and functionality of software, as well as professional development for users on the value and benefit of perinatal data collection to the care of mothers and their babies. Complete and accurate perinatal data entry into the computer contributes to care assisting in it being of the highest standard.

## THESIS CERTIFICATION

### CERTIFICATION

I, Alison Jane Craswell, declare that this thesis, submitted in partial fulfilment of the requirements for the award of Doctor of Philosophy, in the Department of Nursing, Midwifery, Faculty of Sciences, Medicine and Health, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other academic institution.

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## **PUBLICATIONS, PRESENTATIONS AND AWARDS ARISING FROM THIS RESEARCH**

### **Awards**

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### **Peer reviewed publications**

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## DEFINITION OF KEY TERMS

Acronym	Term	Definition
ACHI	<b>Australasian College of Health Informatics</b>	Professional body for Health Informatics in the Asia-Pacific region providing health informatics credentialing for members
	<b>Apgars</b>	A set of five observations each scored out of two, taken on a new born baby at one minute and five minutes after birth
AIHW	<b>Australian Institute of Health and Welfare</b>	Commonwealth of Australia institute providing authoritative information and statistics to promote better health and wellbeing
	<b>Beneficial Engagement</b>	Commitment to a process, in this case perinatal data entry, that results in a benefit to the user in some positive way
	<b>Caesarean Section</b>	Birth of a neonate via surgical incision of the mother's abdomen
CTG	<b>Cardiotocographic monitoring</b>	The monitoring of the foetal heart rate and uterine contractions
	<b>Case-mix</b>	The number and type of clients treated in the hospital used to inform hospital budgeting
CPD	<b>Cephalopelvic disproportion</b>	Condition in which foetal presenting part is too large to fit through the birthing mother's pelvis
	<b>Clinical Coders</b>	Administration staff who code medical records, allocating Diagnostic Related Group's (DRG's) for funding purposes
DoHA	<b>Department of Health and Aging</b>	Commonwealth Government Department of Health and Aging

DRG	<b>Diagnosis Related Groups</b>	Groups of patients with related diagnoses used to inform hospital budgeting
	<b>eHealth</b>	Any electronic exchange of data used in the delivery of health care
EHR	<b>Electronic Health Record</b>	A computer file that replaces a paper medical record for a patient
EMR	<b>Electronic Medical Record</b>	A computer file that replaces a paper medical record for a patient
EPR	<b>Electronic Patient Record</b>	A computer file that replaces a paper medical record for a patient
	<b>Field Definition</b>	A defined expectation of the information to be entered into a field within particular software
	<b>Health Information Manager</b>	A person who manages or maintains patient health records either on paper or via electronic means
HIMAA	<b>Health Information Management Association of Australia</b>	Professional body for health information management professionals within Australia, serving the profession since 1949
HIS	<b>Health Information System</b>	An information system used specifically in healthcare for collection of patient related information
HISA	<b>Health Informatics Society of Australia</b>	Established in 1992, this not for profit organisation supports Australians working in eHealth and health informatics through education and professional development
HIT	<b>Health Information Technology</b>	Technologies or systems used within healthcare for storage and transfer of information

ICT	<b>Information Communication Technology</b>	Technology used for electronic exchange of data
IS	<b>Information Systems</b>	Systems that are designed to create, modify, store and distribute information
IT	<b>Information Technology</b>	The hardware and software making up a computer, that are used to store, retrieve, and manipulate information electronically
	<b>Intrapartum</b>	During childbirth
	<b>Level 1 Midwife</b>	Midwife grade five registered with the Nursing and Midwifery Board of Australia, licensed to practise without supervision and therefore accountable for own actions
	<b>Level 2 Clinical Nurse Midwife</b>	Midwife grade six registered with the Nursing and Midwifery Board of Australia, holding broad knowledge of midwifery practice and able to function in more complex situations
	<b>Level 3 Clinical Nurse Consultant Midwife</b>	Midwife grade seven registered with the Nursing and Midwifery Board of Australia, appointed to advanced practice position with specific leadership roles and responsibilities
	<b>Level 3 Midwife Educator</b>	Midwife grade seven registered with the Nursing and Midwifery Board of Australia, appointed to advanced practice position with specific leadership roles and responsibilities for the education of other midwives

	<b>Medical record</b>	The paper chart allocated to each patient on admission to hospital that includes a record of each admission and associated documents
	<b>MR63D</b>	Identification code for the paper perinatal data form
NMDS	<b>National Minimum Data Set</b>	A minimum set of data elements agreed at a national level for mandatory collection and reporting
NEHTA	<b>National eHealth Transition Authority</b>	Australian Government organisation responsible for implementing eHealth specifically the PCEHR within Australia
NNST	<b>Neonatal screen test</b>	A test recommended by health authorities for all newborn infants that screens for several childhood diseases optimally done between 48 and 72 hours of life
	<b>Partogram</b>	A record of events during labour and birth
PCEHR	<b>Personally controlled electronic health record</b>	An electronic health record that can be accessed by the patient and healthcare professionals who the patient authorises for access
	<b>Perinatal</b>	The period from 20 weeks gestation (or at least 400gr birth weight) up to four weeks of age
	<b>Perinatal Data</b>	A set of data items about a mother and baby collected in relation to the birth of a baby over 20 weeks gestation (or at least 400gr in birth weight). See appendices A and B

	<b>Perinatal Data Coordinator</b>	A person assigned to manage the perinatal data collection at a particular hospital involving extraction of the data to Queensland Health Data Collections Unit
POC	<b>Point of Care</b>	The point in time when the healthcare event occurs
	<b>Pre-Eclampsia</b>	A condition of pregnancy involving high blood pressure, proteinuria and oedema
	<b>Queensland Health</b>	The State of Queensland's publically run health department; a Queensland Government organisation
	<b>Midwife</b>	A person registered and/or legally licensed to practice midwifery in Australia. Not all midwives are registered nurses
RN	<b>Registered Nurse</b>	A person registered and/or legally licensed to practise nursing in Australia
SCN	<b>Special Care Nursery</b>	A level one or two nursery within a maternity unit that cares for sick newborn babies
VBAC	<b>Vaginal Birth after Caesarean section</b>	When a mother gives birth vaginally one or more times after a previous birth by caesarean section
	<b>Ventouse</b>	A cup shaped device used to assist the birth of a baby via application to the foetal head

## CHAPTER 1 - INTRODUCTION

Across Australia maternity units are required to submit perinatal data to fulfill mandatory data collection requirements for national perinatal data collection (Perinatal and Reproductive Epidemiology Research Unit, 2013). A core set of data items entitled the ‘perinatal national minimum data set’ specifies the perinatal data for mandatory collection agreed to by the Statistical Information Management Committee nationally (Perinatal and Reproductive Epidemiology Research Unit, 2013). This mandatory data set was first specified in 1997 for national collection within Australia. The perinatal data collection covers all live births and stillbirths of at least 20 weeks’ gestation or at least 400 grams birth weight.

Within the state of Queensland, midwives collect this birth related population data via the perinatal data collection form. This is done on paper, via a perinatal data online form, or as an extract from a health information system (HIS). This data, used for monitoring the patterns of obstetric, midwifery and neonatal practice, obstetric, midwifery and neonatal outcomes, assists in the planning of Queensland Health services (Queensland’s publically run health organisation), as well as contributes to research and education (Data Collections Unit, 2010).

Up until 2009, the majority of maternity units collected this data on a carbonated paper form from which a copy was sent to the Data Collections Unit of Queensland Health. Completion of the data entered on these paper forms was believed to be in need of improvement (Data Collections Unit, 2009). Thus, computerised entry of perinatal data

commenced in Queensland in 2009, spreading across the majority of hospitals within three years and resulting in 80 percent of perinatal data being collected electronically (Health Statistics Center Queensland Health, 2012). As a result, most perinatal data is currently entered by midwives into a computer rather than recorded by hand on paper. A data quality statement by the Health Statistics Centre of Queensland Health details that this move parallels an improvement in the quality of raw data with error rates reported as significantly lower (Health Statistics Centre Queensland Health, 2012). However, no known research has been undertaken to examine the issues for midwives undertaking this raw data entry in the process of computerising perinatal data collection. Nor has anyone examined how this may impact on accuracy.

Interest in this research topic arose when the researcher previously worked in a role that facilitated migrating data from paper perinatal data forms into a midwifery database. It became clear to the researcher as a result of her experience, that the data on the paper forms was not always the same as what was recorded in the mother or baby's medical record. Further, informal observation of midwives using computer technology as it was integrated into the workplace, also stimulated the researchers interest in this field with questions arising as to how the use of technology by midwives would influence the recording of perinatal data via computer.

This thesis is the culmination of this interest and presents the findings and subsequent theory developed as a result of this passion. This chapter introduces the research, presents the research aim and question, as well as specifying the scope and significance

of this research. This is followed by an outline of the organisation of this thesis and conventions used throughout the thesis.

### **Research Aim**

The aim of this research was to understand the factors that influence midwives interaction with the computer when collecting and entering perinatal data.

### **Research Question**

The research question that guided this study was:

What are the influences on midwives during the process of collecting and entering perinatal data?

This broad research question was used as a guide to the research and was intended to be sufficiently large to allow for dynamic change as the research progressed and as emergence of the process occurred (Moore, 2010).

### **Scope**

This research was carried out in the state of Queensland, Australia. A map of Australia highlighting the state of Queensland is shown in Figure 1. Midwives residing in Queensland, using any software system for entering perinatal data into a computer, were recruited for indepth, individual interview. The selection of participants from Queensland aimed to look specifically at persons with experience working in maternity units that fed data to the Queensland Health Data Collections Unit, rather than working in other units from other states and territories within Australia which have different

additional mandatory items and methods of data collection. The other states and territories also have different legislation affecting their perinatal data collection as well as utilising other software systems for collection. In addition, as this research was undertaken for the fulfilment of Doctor of Philosophy, it needed to be manageable in size. Conducting the research within Queensland allowed for this manageability while providing a rich data set for analysis and theory development.



Figure 1: Map of Australia with the state of Queensland highlighted (Graphic Maps, 2013)

### **Significance of this research**

A Grounded Theory methodology, originally developed by Glaser and Strauss (1967), was used by the researcher to develop a substantive theory explaining the factors that influence midwives interaction with the computer when collecting and entering perinatal data. It is anticipated that this theory will be useful for other researchers and practitioners seeking explanatory theoretical models on which to design information systems for data collection within obstetrics and midwifery. The findings provide an

understanding of how midwives interact with computers in the process of entering perinatal data, and in turn, highlight the issues they face in their daily practice while achieving this. While models of human computer interaction are in existence, there is no evidence within the Queensland or Australian health care context of a theoretical model directly related to midwives utilising computers for perinatal data entry that could be located.

### **Organisation of this thesis**

This thesis is presented in six chapters. Chapter 1 introduces the research, outlines the research aim and question, provides scope, introductory significance, and organisation for the thesis listing the conventions used. Chapter 2 outlines the background, key definitions and provides further significance for this study including technology use in healthcare, midwives use of information and communication technology (ICT), history of perinatal data in Queensland and discussion of data quality in healthcare. The chapter then introduces mandatory use software and theoretical models relating to the use of ICT. This background positions the research within current literature regarding perinatal data collection. Chapter 3 defines the research design, outlining the methodology of Grounded Theory and the associated set of methods used in undertaking this research. Here the researchers worldview is presented and the participants are introduced as well as the way in which the research adheres to ethical guidelines and meets standards of credibility and dependability. Chapter 4 presents the findings, prioritising the voices of the participants in defining the core category of **engagement**, the nine contributing elements and the associated themes derived from the data. Chapter 5 discusses the

findings, their meaning within extant literature in this area and details the emergent **Theory of Beneficial Engagement**. The outline of this chapter closely follows Chapter 4 discussing the contributing elements, associated themes and their relationships with other elements and the core category. Chapter 6 concludes the thesis by presenting the theoretical contribution to knowledge achieved by this research, recommendations arising from this research, recommendations for further research and the limitations of this research.

### **Conventions used throughout this thesis**

For a clear understanding of the organisation of this thesis, the following conventions are adhered to:

- P = participant
- I = interviewer
- *italic text* for quotations from interviews
- (*italic words in parenthesis as part of participant's quote*) = terms unsaid by participant added by researcher for improved understanding
- 'single quotation marks' for added emphasis
- **bolding for the name of the theory, core category and elements**
- underlining for contributing themes

In addition to these conventions, a table of the definitions of key terms was provided in the preceding pages. Throughout this thesis, the researcher is referred to in the third

person. An exception to this occurs in the discussion in Chapter 3, Research Design, in the presentation of the researcher's worldview where the first person and use of "I" is made. Acronyms of regularly used terms such as information and communication technology (ICT) are used, but at times the terms will be written in full to emphasise the importance of the statement and to assist the readability of the thesis.

## CHAPTER 2 - BACKGROUND LITERATURE

The previous chapter introduced the research, offered significance to the need for it to be undertaken, and provided an outline of how this thesis is set out. This chapter continues to build the picture, focusing on the background to the research. It engages with the literature that exists in the areas of perinatal data collection worldwide and within Australia. In particular, a focus on Queensland is provided to ensure saturation across the state in which the study is situated. Further to this, literature is offered regarding perinatal data and an examination of the literature that surrounds midwives and their use of ICT.

To achieve this goal, the chapter begins with a definition of terms to ensure clarity of nomenclature before moving on to describe the movement of technology into healthcare. Then the literature regarding midwives use of technology is discussed. Following this discussion, perinatal data collection within Australia, with a specific focus on Queensland, is addressed, including how the collection is used. Discourse continues describing the transition of perinatal data collection from paper to computer. At this point, a definition of mandatory use ICT systems and differentiation of such systems from voluntary use systems is presented. Finally, the history of research into data quality and integrity regarding perinatal data collection worldwide and within Australia is outlined. As this research was undertaken using a Grounded Theory methodology, no extensive review of the literature prior to undertaking this research was performed. The rationale for such adherence to methodological philosophy is described in greater detail in Chapter 3. However, in order to ensure the research was

not duplicating existing knowledge, reading around the literature in the areas of perinatal data and midwives use of computers was undertaken. A clear gap in the literature was identified which this research endeavoured to fill.

## **Definitions**

Throughout the literature, a diversity of terminology that is used to describe technology in healthcare was observed. The range of terms include eHealth (Mills, Chamberlain-Salaun, Henry, Sando & Summers, 2013), Information Communication Technology (ICT) (Hwang & Park, 2011; Lupianez-Villanueva, Hardey, Torrent & Ficapal, 2011), Health Information System (HIS) (Rahimi, Vimarlund & Timpka, 2009), Health Information Technology (HIT) (Cresswell & Sheikh, 2013; Ward, Vartak, Schwichtenberg & Wakefield, 2011), Electronic Health Record (EHR) (Flipover, 2013; McGinn, et al., 2011), Electronic Patient Record (EPR) (Jones, Henwood & Hart, 2006) and Electronic Medical Record (EMR) (Hsu, Lui, Weng & Chen, 2013; Turner, 2010). Regular use of the term Information Technology (IT) was also noted (Hsu, Hou, Chang & Yen, 2009).

The World Health Organization (WHO) defined eHealth as

...use of information and communication technologies (ICT) in health to, for example, treat patients, pursue research, educate students, track diseases and monitor public health.

(2011, p. 1).

Such a difference in terms can lead to confusion. Therefore, to ensure clarity for the purposes of this research, the term Information Communication Technology (ICT) will

be used to refer to technologies used in healthcare. This is done in an effort to focus specifically on the use of computer interfaces in healthcare, and to exclude the wider eHealth technologies such as telemedicine, in-home care and issues for General Practice. However, eHealth is the term that will be referred to when it was the expression that was used in the literature reviewed.

### **Technology in healthcare**

The 21<sup>st</sup> Century has seen a rise in ubiquitous computing in both the workplace and in use by individuals (Fujino & Kawamoto, 2013; Hollan, Hutchins & Kirsh, 2000). Within healthcare specifically the use of technology was proposed as a strategy to combat the rising costs of healthcare as well as the decreasing availability of skilled staff and was said to provide improved efficiency of healthcare delivery and increase the portability and comparability of health related data (Deloitte, 2008; Eley, Fallon, Soar, Buikstra & Hegney, 2008b; Healy, Sharman & Lokuge, 2006; National eHealth Transition Authority (NEHTA), 2013; Smedley, 2005; Vimarlund & Koch, 2012; Yu & Comensoli, 2004). However to date, evidence that the use of technologies in healthcare has achieved these outcomes is yet to be seen in the literature (Black, et al., 2011; Car, et al., 2008; Chaudhry, et al., 2006; Urquhart, Currell, & Hardiker 2009). A systematic review addressing quality and safety of health care by Black et al. (2011) did not result in a demonstration of the benefits that technology was meant to provide in healthcare. Black et al.'s research, utilising techniques from established Cochrane systematic review principles, examined 53 systematic reviews focusing on the impact of eHealth

interventions and a further 55 supplementary systematic reviews of supporting information between the years 1997 and 2010. The authors state that:

There is a large gap between the postulated and empirically demonstrated benefits of eHealth technologies... there is a lack of robust research on the risks of implementing these technologies and their cost-effectiveness has yet to be demonstrated, despite being frequently promoted by policymakers and 'techno-enthusiasts' as if this was a given.

(Black, et al., 2011, p. 1)

These authors suggest that further research in the area of ICT will provide knowledge to support the ongoing and increasing spending in eHealth. A further review of the literature surrounding supposed ICT benefits found that these innovations still led to unexpected costs and a need for organisational change (Vimarlund & Koch, 2012). Recent research reviewing productivity gains by nurses using ICT found that such technology failed to provide cost saving or superior productivity for nurses (Abass, Helton, Mhatre & Sansgiry, 2013). Regardless of the lack of concrete evidence of benefit, technology continues to be the focus of political policy and a priority of healthcare spending worldwide. Within Australia the annual national budget for ICT expenditure in health care is estimated to be \$2billion (BuddeComm, 2013). Currently this is cost driven by investment in developing eHealth initiatives. In comparison with other Organization for Economic Cooperation and Development (OECD) countries, the Australian national expenditure is small as is demonstrated in Table 1 below. In the 2011 - 2012 Queensland budget, ICT within the Queensland Department of Health was allocated \$61.2million for replacing, upgrading and providing future capability (Lohman, 2011).

Table 1: Estimated expenditure on eHealth initiative per OECD  
Country based on 2006 data (Jolly, 2011)

Country	Total spending on specific eHealth initiatives in \$millions	Per capita spending on specific eHealth initiatives
USA	\$128.25	\$0.44
Australia	\$100.45	\$5.06
Canada	\$1,108.08	\$32.68
Germany	\$1,846.80	\$21.75
Norway	\$53.78	\$11.73
UK	\$11,337	\$197.80

Within Australia, the Commonwealth Government policy for health includes the National eHealth Strategy (Australian Government, 2012; Deloitte, 2008). This strategy was commissioned by the Australian Health Ministers' Advisory Council and delivered by Deloitte (2008), a private company providing services in health economics for government bodies. This strategy was presented at the Australian Health Ministers Conference in December 2008, in an effort to guide national coordination and collaboration in eHealth. National consultations in preparation of the strategy included, but were not limited to:

- Federal, state and territory governments
- General practitioners
- Medical specialists
- Nursing, midwifery and allied health
- Pathology, radiology and pharmacy sectors
- Health information specialists
- Health service managers
- Researchers, academics and consumers

(Western Australian Government, 2008)

The National eHealth Strategy involves increasing funding to eHealth technologies, a national broadband network for improved accessibility of ICT, introduction of the personally-controlled electronic health record (PCEHR) and the linking of funding to the uptake of recommended eHealth technologies. The need for such a fundamental change has its foundation in the spiralling cost of healthcare, as noted below.

The Australian health care system is straining to deal with increasing cost and demand pressures and a shortage of skilled health care workers. We have to move away from a reliance on tools such as pen, paper and human memory to an environment where consumers, care providers and health care managers can reliably and securely access and share health information in real time across geographic and health sector boundaries. The only way this can be achieved is through the implementation of world class E-Health capability.

(Deloitte, 2008, p. 4)

The Allen Consulting Group (2008), an independent consulting group delivered a private report to the National eHealth Transition Authority (NeHTA), established in 2005 to develop national core eHealth foundation elements such as standards, identifiers and terminologies. The report estimated that a shift to eHealth will reduce annual healthcare costs by up to \$5.4 billion. Further to this, a private management consultancy company, Booz and Company, in a report authored by Bartlett et al. (2010), suggest that based on the overseas experience, a national eHealth program would cost upwards of \$4 billion but that this would be offset by savings in reduced medication errors and efficiencies of healthcare of \$7.6 billion annually by 2020. Bartlett et al. (2010) report that approximately 10.4 percent of clients are prescribed the wrong medication and that information sharing via eHealth technologies can significantly reduce these costs via error reduction. Medication errors are estimated to cost \$660 million and, more

importantly, contribute to 18,000 deaths annually (Roughead & Semple, 2009). Suggested savings via the use of ICT are proposed to stem from reduction in average length of stay in inpatient units and wait times, avoidance of duplication of tests and enhanced health workforce productivity relating to efficiencies in client information record-keeping. However, achievement of these enormous cost savings suggested by projected estimates such as those outlined above, are not yet visible within Australian literature. Moreover, an Australian Parliamentary report (Jolly, 2011) concludes that although eHealth does have great potential for Australia such as resolving the tyranny of great distance and reducing the costs of caring for an aging population, harnessing that potential requires finding and negotiating a delicate balance between many interests and issues. Such transformation in healthcare delivery at a macro-level involves huge change at a micro-level; that is the day-to-day work carried out in healthcare institutions. Nurses and midwives are the largest demographic working in healthcare, as can be seen in Table 2. This professional grouping made up over 40 percent of the total Australian health workforce in 2006 (Australian Institute of Health and Welfare (AIHW), 2010). Therefore, they are at the centre of this change in practice being implemented to achieve these purported aims, namely utilisation of ICT.

Table 2: Division of employment of nurses compared to other healthcare workers (AIHW, 2012, 2013a, 2013b, 2014).

<b>Persons employed in health occupations: Australia, 2001, 2006 and 2011</b>			
<b>Occupation</b>	<b>2001</b>	<b>2006</b>	<b>2011/2012</b>
Medical practitioners	51,791	57,019	79,653
Medical imaging workers	8,170	10,477	7,806
Dental workers	25,876	29,624	n/a
<i>Nursing workers</i>	<i>193,767</i>	<i>222,133</i>	<i>283,577</i>
<i>Registered nurses</i>	<i>174,268</i>	<i>202,735</i>	<i>232,045</i>
<i>Enrolled nurses</i>	<i>19,499</i>	<i>19,398</i>	<i>51,532</i>
Pharmacists	13,925	15,339	21,331
Allied health workers	51,046	65,284	66,658
Complimentary therapies	10,964	16,354	n/a
Aboriginal and Torres Straight Islander health workers	916	1,012	n/a
Other health workers and other health service managers	90,267	131,142	n/a
<b>Total health workers</b>	<b>446,722</b>	<b>548,384</b>	<b>n/a</b>

### **Midwives use of ICT**

Engagement with the literature revealed a diverse range of research in relation to nurses, midwives and their use of ICT. This review noted that foci existed around Health Information System (HIS) implementation and electronic health records (EHR). It is important to note that the research in this area focusing on midwives specifically is sparse as studies are often related solely to nurses, or they combine midwifery with nursing data (Hillan, McGuire & Cooper, 1998; McKenna & McLelland, 2011; Webster, et al., 2003). As a result, and in order to provide some context, intermittent reference to research findings relating to nurses will be presented here.

Despite the increased use of technology within healthcare practice, confidence and competence in ICT use by nurses and midwives varies according to age, computer use at home, education and training (Campbell & McDowell, 2011; Chan, Brew & De

Lusignan, 2004; Darbyshire, 2004; Dillon, Lending, Crews Jr & Blankenship, 2003). Dillon et al. (2003) surveyed 140 nurses in Kentucky (USA), regarding their confidence, attitude and computer skills and how these related to their ability to use an information system prior to the installation of a dedicated Health Information System (HIS). The researchers found that nursing education as well as home and previous computer use predicted self-efficacy or confidence in system use. Dillon, Blankenship and Crews Jr (2005) identified that improvement to the computer confidence of nurses takes time and is something to which healthcare organisations should commit. Other research conducted in the USA determined that overall, online nursing documentation improves the data quality and end-user satisfaction (Langowski, 2005). The review cited here included a quasi-experimental design; one randomised controlled trial and a chart review assessing documentation compliance and completeness after online point of care documentation systems were introduced. Satisfaction though, regarding the use of such online data collection tools, is dichotomous. Indeed Langowski (2005) argued that some nurses may view the changes that ICT brings as exciting and challenging, whilst others find these changes provoke anxiety.

Kaya (2010) conducted research via purposive sampling with 890 nurses from a state and a university hospital in Turkey, to assess their attitudes toward using computers in healthcare as well as the factors affecting their attitudes. This author found that nurses exemplified a positive attitude to computers, but significant differences were identified regarding the age of the nurses, their education, prior computer experience and duration of computer use. In the United Kingdom (UK), Chan, Brew and De Lusignan (2004) surveyed a small group of community nurses, finding that nurses over 50 years of age

were lacking in confidence and used computers less than younger staff even though they had received more training. They reported that only 53 percent of district nurses identified themselves as confident in using computerised medical records. Brumini et al. (2005) studied attitudes towards computers of 1081 hospital nurses in two Croatian hospitals where integrated information systems were being implemented. They concluded from their study that computer education and experience are the two key contributing factors in the development of positive nurse attitudes towards computers.

Throughout the literature both internationally and within Australia, nurses and midwives are found to have favourable attitudes toward the use of ICT (Hwang & Park, 2011; Mills, et al., 2013). However, results from pre and post ICT implementation studies (Chao & Gilbert, 2012; Eley, Soar, Buikstra, Fallon & Hegney, 2009; Laramee, Bosek, Shaner-McRae & Pwers-Phaneuf, 2012; Mills, et al., 2013), find that these positive attitudes are reduced after ICT implementation (Mills, et al., 2013). Oroviogicoechea (2009) argues that after implementation it is no longer attitude that is being measured, but satisfaction in relation to the experience of using a particular ICT system. Even so, this literature suggests nurses and midwives rate either their attitude or satisfaction lower than their pre-implementation beliefs around likely success of meaningful-use post implementation of ICT. The potential for ICT to offer improvement to work practices and the reality of using these technologies are not always equal as identified by Chao and Gilbert (2012). Baker et al. (2007) conducted extensive qualitative research into perspectives from nurses working at a wide variety of fields in health care units across the UK through key informant interviews and focus groups. They report that the main finding of their project was

...an enormous gap between the vision of the potential of eHealth as it was enthusiastically articulated by the eHealth leaders and the reality experienced by frontline nurses.

(Baker, et al., 2007, p. 5)

Midwives were thought to have missed opportunities that other health professional groups such as medicine and related disciplines have had in influencing the development of clinical systems (Arshad & Thompson, 2007).

Although Australian nurses and midwives express attitudes favourable to the use of ICT, they have been found to lack knowledge, confidence and readiness for these technologies in their workplace (Edirippulige, Smith, Young & Wootton, 2006). Other authors such as Eley, Fallon, Soar, Buikstra and Hegney (2008a), Smedley (2005) and Webster et al. (2003), report that the confidence of nurses and midwives in using eHealth in their practice generally, as well as their overall acceptance of ICT in the workplace is low. As has been suggested in other literature (Barnard, Nash & O'Brien, 2010; Eley, et al., 2008b; Garde, Harrison & Hovenga, 2005; Smedley, 2005), recommendations were made that ongoing education and training was required in this area. The importance of education for nurses and midwives in health informatics and ICT at an undergraduate level, and as part of continuing education, is widely discussed, supported and recommended in the literature (Booth, 2006; Edirippulige, Smith, Beattie, Davies & Wootton, 2008; Eley, et al., 2008b; Fujino & Kawamoto, 2013; Sinclair, 2009; Spiste Bond, Lewis & Joy, 2009; Ward, Stevens, Brentnall & Briddon, 2008). Without proper preparation, training and motivation, nursing and midwifery as professions may miss the opportunity of being closely involved in eHealth innovation, as well as being sufficiently skilled and confident in utilising ICT. This is an important

consideration as healthcare moves further into the twenty first century requiring efficient and appropriate use of the above-mentioned technologies by nurses and midwives. A recent report for the Australian Government Office of Learning and Teaching (Gray, Dattakumar, Maeder, Butler-Henderson & Chenery, 2014) regarding eHealth education for clinical health professionals, found that there exists a lack of access to high-quality widespread formal education in eHealth and health informatics. The report recommends that further curriculum research and development is required across all sectors before healthcare workers can meet the challenges that eHealth is bringing to practice.

The success of ICT in healthcare depends on how well it is adopted by nurses and midwives with both often being seen as the linchpin for the successful uptake of such technology within healthcare organisations (Edirippulige, 2005; Kirkley, 2004; Lang, 2006; Queensland Government, 2012a). Other authors discuss the value of the ICT nurse or the ICT midwife who becomes the motivator for change as the resource person and the ICT coordinator on individual units (Henwood & Hart, 2003; Jones, et al., 2006). Such clinical leaders with technical informatics skills also are thought to possess a vision of long term commitment to the use of ICT and believe in the value of ICT (Ingerbrigtsen, Georgiou, Clay-Williams, Magrabi, Hordern et al., 2014). Existence of such agents of change within the workplace, act to encourage and enable ease of access. As a consequence, this increases the ‘buy in’ of the staff; the very people who are required to use the system (Kirkley, 2004). Rapid advancement in the field of health and nursing informatics (Guenther, 2006) and identification of the role of the Health Informatics Practitioner (HIP), provide professional identification for the nurse or

midwife with a particular focus along with extra training in ICT (Schaper, 2012). A Health Informatician Australasian Program was launched at the recent 21<sup>st</sup> National Health Informatics Conference (HIC) 2013, in Adelaide, South Australia, to aid in the professional identification of such skilled practitioners. The qualification entitled Certified Health Informatician Australasia (CHIA) will enable professional development within the health informatics field for health professionals including nurses and midwives. It resulted from a joint effort of the Health Informatics Society of Australia (HISA), the Australian College of Health Informatics (ACHI), and Health Information Management Association of Australia (HIMAA) (HISA, 2013a). This certification closely models international certifications developed by the International Medical Informatics Association, Canada's Health Informatics Association and the American Medical Informatics Association (HISA, 2013b).

Reported barriers to the successful uptake of ICT by nurses and midwives in the literature are elicited from studies evaluating issues such as point of care documentation (Kohle-Ersher, Chatterjee, Osmanbeyoglu, Hochheiser & Bartos, 2012), successful adoption of ICT, (Eley, Fallon, Soar, Buikstra & Hegney, 2009) and barriers to enhancing knowledge of ICT (Edirippulige, 2005). Findings relating to uptake range between clinical work demands being seen as greater than the use of ICT, a lack of access to computers and lack of support (Eley, et al., 2009). Issues related to privacy concerns and adapting workflows were also evident in the literature (Kohle-Ersher, et al., 2012). Findings from a literature review by Lluch (2011), which examined organisational barriers, included the identification of ICT 'tasks' and the resultant need to change workflow, work processes and routines. These new ways of working that the

introduction of ICT brings, were found to be a barrier to successful use. A recent review of the literature undertaken by Mills et al. (2013) also identifies lack of training in eHealth, lack of consultation prior to implementation and a resistance to change as being further barriers to successful adoption of ICT within nursing and midwifery. Contrary to this, but some years earlier, a comparative study from the aged care sector suggested that although similar barriers initially exist with the use of electronic documentation systems, these diminished over time (Yu & Comensoli, 2004). However, the differences in complexity of acute hospital systems compared with the somewhat relative stability of aged care systems may be a factor in this difference.

Within Australia, midwives working in urban, regional and rural areas are exposed to ICT, thus overcoming huge distances with regard to access to communications and information. This is important in a vast continent spanning 7,617,930 square kilometers, almost as large as the US, about 50 percent greater than Europe and 32 times greater than the UK. See a visual representation of this size comparison in Figure 2 below. As discussed earlier, for Australia, the potential for improved access for rural and remote areas to information using ICT is a major driver of the implementation of technology within healthcare (Jolly, 2011).

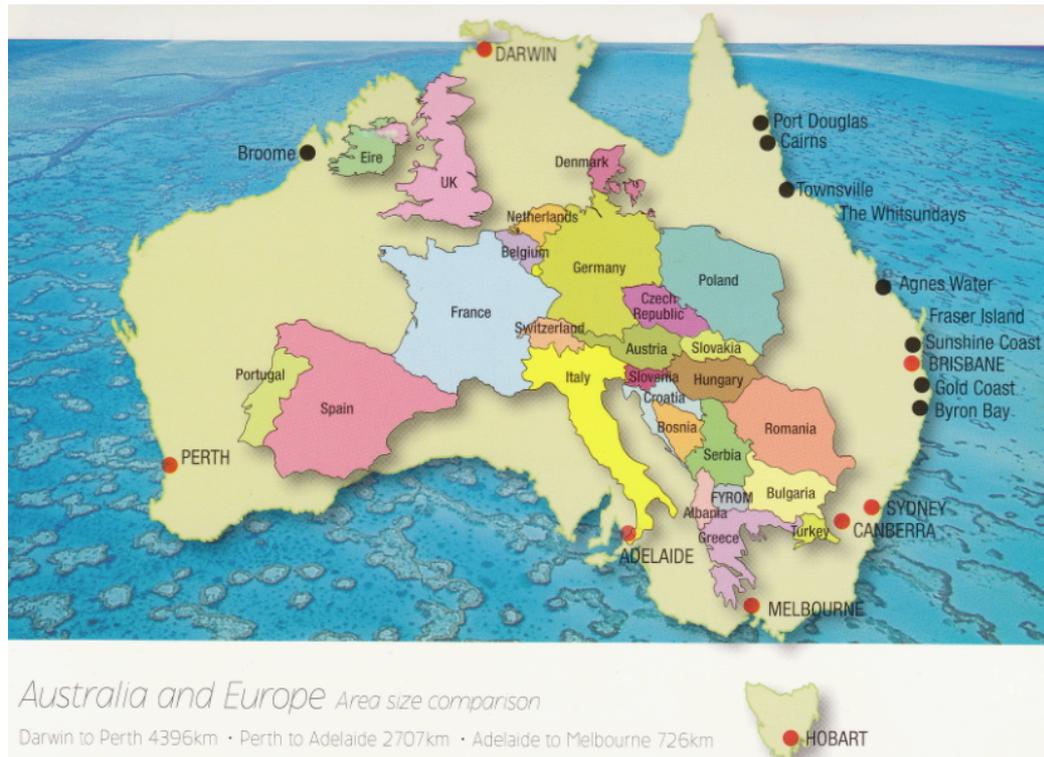


Figure 2: Comparison of relative size of Australia to Europe (ericklounge, 2010)

The use of ICT in midwifery includes online professional education packages, email, client records management, pathology results retrieval, and digital imaging to name a few (Eley, et al., 2008b). Adding to this, a growing number of hospitals Australia-wide are using or introducing a health information system and utilising electronic health or medical records (Smedley, 2005). The Australian Nurses Federation, the national union for nurses, midwives, assistants in nursing and nursing students, envisages that nurses and midwives will be the largest users of ICT. This includes the personally-controlled electronic health record (PCEHR), released nationally within Australia in July 2012 and slowly being integrated into practice (Australian Nurses Federation, 2011). This proliferation in the use of ICT in healthcare within Australia requires a parallel move by midwives to embrace ICT and engage in professional development in these technologies

for their successful integration into practice. Within obstetric practice, the majority of maternity centres in Queensland, the site for this study, collect perinatal data using ICT.

### **Perinatal Data**

As already alluded to in the introduction, perinatal data is collected across Australia by staff of maternity units to fulfil mandatory data requirements for national perinatal data collection (Perinatal and Reproductive Epidemiology Research Unit, 2013). Mandatory data collection items for each state and territory are updated annually to reflect the Perinatal National Minimum Data Set (NMDS) regulated in Australia's capital, Canberra, by the Australian Institute of Health and Welfare National Data Statistics Unit (AIHW, National Perinatal Statistics Unit, 2011). A minimum data set is defined as a list of data elements of uniform definition containing the least number of data items required to fulfil a particular job (Conrick, Walker, Scott & Frean, 2006). The AIHW describes the perinatal NMDS as

... contingent upon a national agreement to collect uniform data and to supply it as part of the national collection, but does not preclude agencies and service providers from collecting additional data to meet their own specific needs.

(AIHW, 2013c, p. 1)

Definitions of the data elements contained in the NMDS are to be found in a National Health Data Dictionary providing uniform clarity of meaning behind each required data element (AIHW, 2013c). National requirements for perinatal data collection commenced in the 1990s with data publications from the Australian Institute of Health and Welfare utilising data from individual state perinatal data collections (AIHW, 2013b). The national minimum data set determinants have standardised the data items

required for better quality collection at a national level. The metadata for this set of determinants can be seen at Appendix A.

A closer examination of the state of Queensland reveals that perinatal data collection commenced in November 1986 via the paper perinatal data collection form. An example of this form can be seen at Appendix B. The first areas of Australia to begin perinatal data collection were the states of Tasmania, South Australia, Western Australia and Victoria who had well-established perinatal data collections by 1986 and were publishing their data annually (AIHW National Perinatal Statistics Unit, 1988). International focus on maternal health was intensified at this time, after the publication of “Where is the M in MCH (Maternal and Child Health)?” (Rosenfield & Maine, 1985), a review suggesting that global focus on newborn and child health neglected the health of the mother. In Queensland, the state government, a conservative party, had just been re-elected for a record sixth term of office. The then ‘National Party’ took office with enough seats to stand alone, splitting from the Liberal Party with whom it had jointly held office for the previous five terms. This government was in office while public outcry, regarding the infection of four babies with HIV after being administered blood transfusions in Queensland, occurred. Three of them subsequently died as a result (Morley, 1984; Power, 2011). A contemporary headline can be seen in Figure 3. The Health Minister of the time, the Honourable Brian Austin M.P., was under mounting pressure in the wake of the AIDS epidemic to act to protect other infants from a similar fate. Although not instituted until some years later, the commencement of perinatal data collection in Queensland, following on from other states of Australia, appeared to fulfil

some of the needs of this volatile time in an effort to closely monitor the mortality and morbidity of mothers and babies.

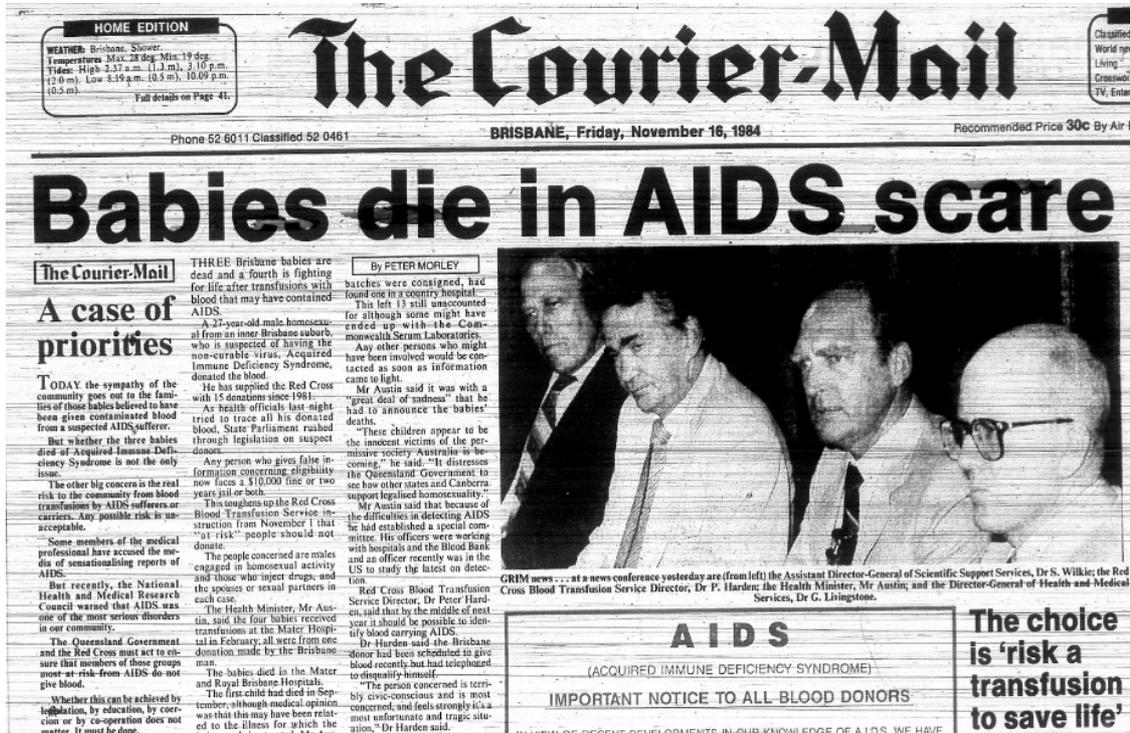


Figure 3: Babies die in AIDS scare (Morley, 1984)

The state of Queensland covers an enormous geographic area. The population however, is relatively small in comparison to its size and the most recent population statistics suggest there are 4,650,880 people (Queensland Government, 2013b). This represents 20.2 percent of the current Australian population (Australian Bureau of Statistics, 2013). The annual number of registered births in Queensland is growing parallel to the birth rate of Australia, as can be seen in Figure 4 below.

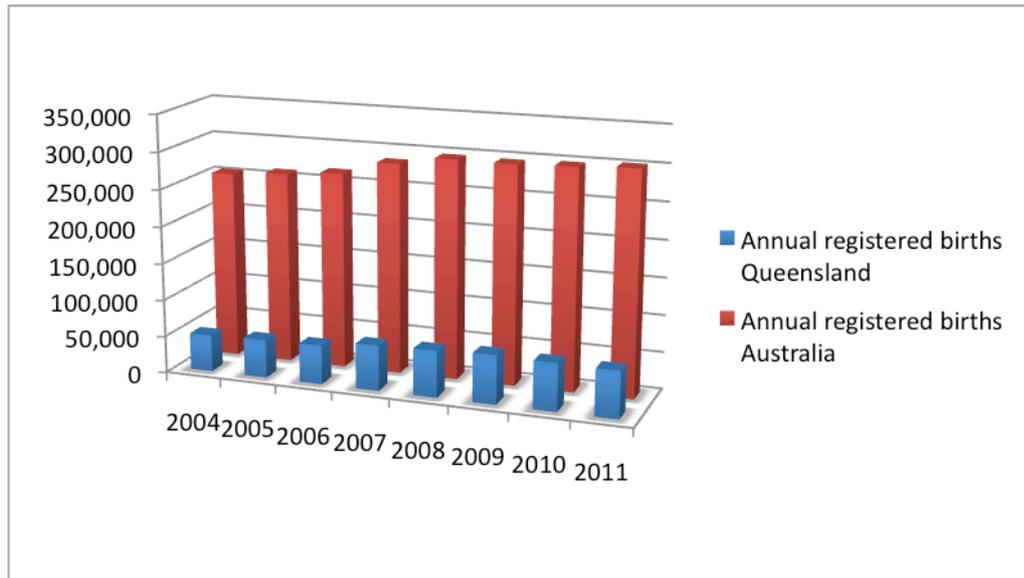


Figure 4: Annual registered births Queensland in relation to Australian annual registered births (Queensland Government, 2005, 2006, 2007, 2008, 2009, 2010b, 2011, 2012b).

Geographically a large state on the east coast of Australia, its population is scattered along the coast, a distance of approximately 2240kms from the southern border with New South Wales (NSW) to the tip of Cape York. The main population lives in the south east corner. See Figure 5 below. This means a diversified health service is needed to cover urban, regional and rural areas with huge distances in between.

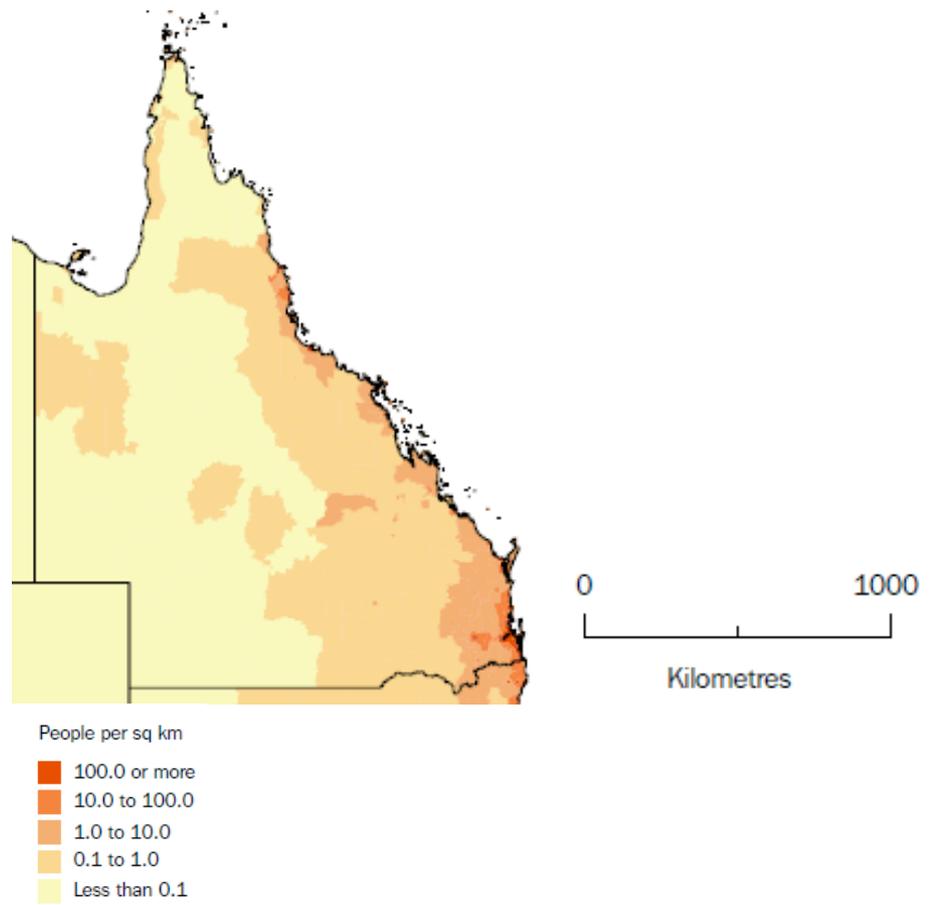


Figure 5: Geographic population distribution State of Queensland (Australian Bureau of Statistics, 2012b)

The role of the perinatal data collection for Queensland is to assist in determining areas of need across the state within the disciplines of midwifery and obstetrics. Indigenous populations in Queensland number 155,824, or 3.6 percent of Queensland's population (Queensland Treasury and Trade Office of Economic and Statistical Research, 2012). This is the second largest state Indigenous population in Australia after the state of NSW. 64 percent of Australia's Torres Strait Islander population and 24.8 percent of Australia's Aboriginal population lived in Queensland at the time of the 2011 Census. Perinatal data collection is often the first point of identification of Indigenous status, and information from the collection, helps to determine healthcare needs for Indigenous

populations across Queensland for whom health outcomes remain poor. Indigenous infant mortality rates persist at almost twice the non-Indigenous level despite much work in this area (Australian Bureau of Statistics, 2012a). See Figure 6.

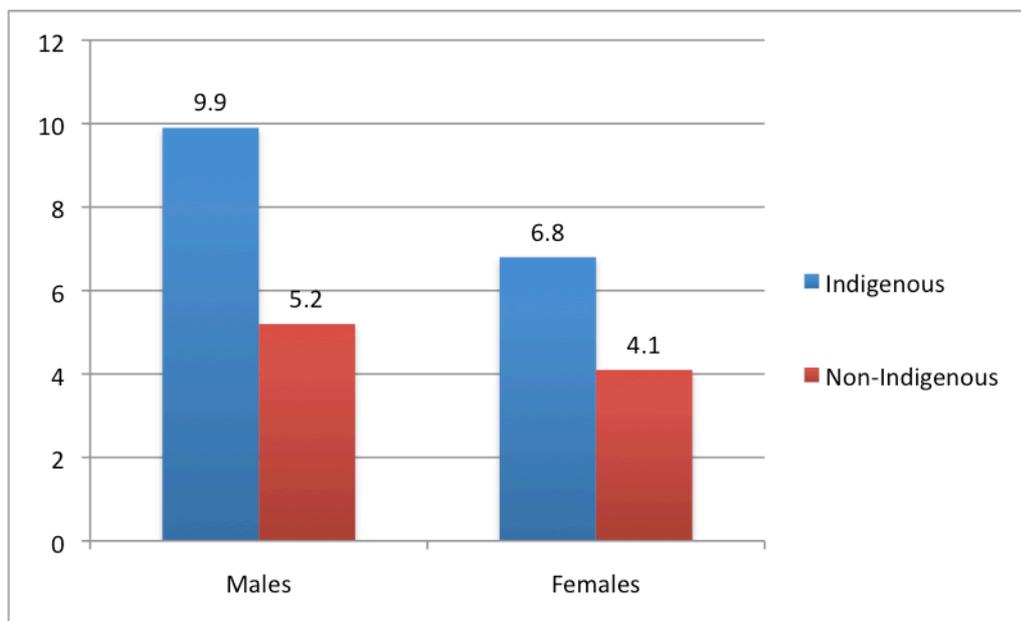


Figure 6: Infant mortality rates for Indigenous and non-Indigenous infants in Queensland (Australian Bureau of Statistics, 2012a)

Historically, in Queensland, data recorded for perinatal data collection was hand written mainly by midwives and entered onto a carbonated paper form which was numbered and called the MR63D. This systematised approach to data collection was due to an amendment to the Health Act 1937 to include perinatal data collection “... to provide a basic source of information for research into obstetric and neonatal care and to assist with the planning of Queensland’s health services” (Queensland Government, 2010c, p. 8). The relevant component from this Act was replaced by the Public Health Act of 2005 and includes a requirement (Chapter 6, Part 1) that perinatal data for every baby born in Queensland be provided to the Chief Executive of Queensland Health. The

collection of perinatal data is also mandated at a Federal Government level Australia wide. Diers (2007, p. 104) reported that a similar system in the state of NSW, “It is a free-standing perinatal database of enormous power in a health care system owned by the government, and is therefore public data”. Perinatal data is publically available via the Queensland Government through the Health Statistics Unit Publications (Queensland Government, 2013a) and has been mined to support changes in policy for midwife-led care, as well as to provide evidence of the increasing costs of intervention in childbirth.

Data collected via the perinatal data form serves to monitor patterns of obstetric and neonatal practice and provide analysis of obstetric and perinatal outcomes such as mortality rate and congenital abnormalities (Data Collections Unit, 2010). This data also assists in the planning of Queensland Health services through provision of statistical information, provides a course of information for research into obstetrics and neonatal care in Queensland and is used in the education of midwifery and medical students (Data Collections Unit, 2010). Such a diversity of use demonstrates the importance of accurate perinatal data collection. Further to this is the significant role that perinatal data collection plays in funding health care delivery in Queensland. Existence of the perinatal data form within the medical record in part informs clinical coders, assisting them in allocating diagnosis related groups (DRG’s) and casemix codes for a hospital admission. These are then used to determine funding for health care institutions (Healy, et al., 2006). Health care funding requirements remain a contentious issue and large amounts of revenue are involved. The Queensland Government recently budgeted a record \$11.046 billion for health care for the 2011/2012 period (Queensland

Government, 2010a). Inaccurate or incomplete perinatal data that has been entered for collection and analysis, which is then used as a determinate of service delivery needs, has the potential to lead to inadequate or misrepresented funding dissemination to healthcare facilities (Wilbanks, Moss & Berner, 2013). Funding is an incentive to accurate data entered in a timely fashion (Heslop, Gardner, Diers & Poh, 2004). Such is the significance of the perinatal data collection.

### **Data Quality in Healthcare**

The quality of healthcare depends on the integrity, reliability and accuracy of health information (Bowman, 2013). Vital statistics, generated through population health data sets, are the major source of continuous monitoring of births and deaths over time; and the usefulness of such vital statistics, including perinatal data, depends on their quality (Mahapatra, et al., 2007). The Australian Commission on Safety and Quality in Healthcare was established in 2006 and is funded by the Australian, State and Territory Governments. Its aim is to develop a national strategic framework and associated work program to guide improvements in safety and quality across the health care system in Australia (ACSQHC, 2013; AIHW, 2013c). This Commission relies on data collected from population data sets, one of which is the perinatal data collection. For the Commission to accurately determine areas where quality and safety are potentially lacking, the data reported needs to be accurate and truly representative of the groups it represents. In the case of perinatal data, this cohort is mothers and their newborn babies. Anath (2005), cites seven validation studies relating to such population databases questioning reliability and accuracy, and one for inconsistent data collection procedures.

The author highlights the need for continuous quality improvement of these vital records. In conjunction with such quality improvement, rapid response to changes in perinatal data statistics is required to disseminate information to healthcare institutions to act on the data (Henderson, Suchdev, Abe, Johnston, & Callaghan, 2014). This can only be achieved once quality and timeliness of the data for collection are considered.

Funding allocation on the basis of population data therefore requires information to be accurate if effective fiscal allocations are to be made. In a report by Staines, Lyons and Doyle (2001), the importance of data quality is stressed because data thought to be of poor quality will not be believed and anomalies shown will not be acted upon as they will be assumed to be from errors in the data. They also cite the huge costs of cleaning data, working around the problems of poor quality data and subsequent delay in decision-making. Further to this, Nicholson and Penny (2004), assert that decision-making is directly influenced by the quality of data, and that a healthcare provider's future is linked to each professional's performance in relation to this. Such is the importance of accuracy. The significance of this has been reinforced by the Queensland Perinatal Data Collections Unit (Data Collections Unit, 2010, p. 210) who state, "...the quality of information produced from the perinatal data collection depends on the accurate, consistent and timely completion of the forms". Inadequate outcome reporting as a consequence of poor or inaccurate data collection, could also lead to negative implications for health service users.

Another issue of accuracy in the perinatal data collection, specifically when data is gathered on paper forms, relates to transcription error. A transcription error occurs when

data is entered incorrectly by persons copying from one source to another (Hogan & Wagner, 1997). The data that midwives traditionally recorded on the paper forms was then entered into computer databases at the Data Collections Unit of Queensland Health (The Health Statistics Centre, 2008). The literature reports that transcription errors can range between 10 percent and 39 percent of occasions (Khoury, Burnett & Mackay, 1996; Wilton & Pennisi, 1994). Hogan and Wagner (1997) in their extensive systematic review of the literature published in the Cochrane Database, state that “Contrary to conventional wisdom, ... data entry is a relatively minor cause of error and that other factors such as the scope of the computer-based patient records play a larger role” (p. 352). However, as data collection approaches within healthcare have changed over time so that data is entered directly into computers, the risk of transcription error has diminished. In the case of perinatal data, it is now the users of this technology, in this case the midwives, who interact directly with the technology. Different types of ‘errors’ are now becoming apparent.

### **Research into perinatal data quality**

Midwifery, as a specialist practice, has historically been an environment in which an interrupted workflow is the norm; one in which the workflow of midwives is dynamically changing (Cooper, Viller & Burmeister, 2004). Efficient and accurate data entry onto paper as well as Health Information Systems may be influenced by factors such as workload, access to computers, and ICT literacy of staff (Craswell, Moxham & Broadbent, 2013e). As a result of the perceived problems in perinatal data collection, research has been conducted that examines the quality and integrity of the collected

data. As early as 1975, authors worldwide examined the accuracy of data being collected on mothers and babies globally. In the United States of America (USA), David (1980) reported on the quality and reliability of birth data collected and written on birth certificates and then sent to be entered onto magnetic disk. This information was de-identified and made available to researchers. Completeness of data on birth weight ranged from 81.7 percent to almost 100 percent. Five years later, Hangsleben and Schamber (1985) reported on the development of a paper form to collect midwifery data items that were subsequently entered into a computer for analysis. They identified data inaccuracy as a problem and cited methods for improvement. These included designating one person who was to be responsible for checking as well as verifying the data at the time of input. This approach was said to increase data accuracy but simultaneously contributed to increased costs. Within a tight fiscal environment, anything that increases costs is not likely to be adopted (Lluch, 2011). Within the USA, more recent research into the development of a national data registry for midwife led births, revealed that 42 percent of the over 10000 records required review, with 21 percent needing the researchers to contact the midwife who entered the data in order to clarify it. In a comparison of case notes to a maternity database in the United Kingdom (UK), Maresh, Dawson and Beard (1986) found a rate of 95 percent accuracy in midwife-entered data on 160 data items. Also in the UK, Cleary et al. (1994) found data matched at between 77 percent and 100 percent accuracy, and reported that this supportive of using their data collection method as a model for other health care agencies. Lain et al. (2011) have recently published a systematic review of data quality in perinatal population health databases worldwide. This review analysed 43 studies that particularly examined accuracy and completeness in relation to validation. They found

birth data to be less accurate on a range of items than data from hospital discharge databases. This supports the contention of earlier research, such as that by Devlin, Desai and Walaszek (2009) who demonstrated that hospital discharge data was generally more accurate than birth data. These findings are consistent with other research in midwifery. In more recent research within maternity units in the UK, it was found that, in the 11 computerised health information systems where the attending midwife entered routine data, there was a universal concern that this local data was not fit for purpose (Simms, et al., 2013). This raises significant concerns given the previous discussion regarding the use of perinatal data.

In Australia, validation studies on perinatal data records have also been published (Chen, Roberts, Simpson & Ford, 2011; NSW Health, 2000; Riley & Griffin, 1997; Riley & Halliday, 1998; Riley, Phyland & Halliday, 2004; Roberts, Bell, Ford & Morris, 2009; Robertson, 1996). However, none of these relate specifically to Queensland, nor do they examine online perinatal data entry and the processes that surround it. The underlying theme throughout these studies that assess the quality of perinatal data is that high quality data is variable and that researchers need to be more aware of the quality of data they are using. Chen et al. (2011), in their study on record linkage, examined the recording of pre-eclampsia, a condition relevant to a mother in pregnancy. This research assessed the recording of pre-eclampsia via perinatal data utilising different methods. The researchers found that cases ascertained for all conditions were higher in admission hospital records than in the birth data, in this case the New South Wales (NSW) Midwives Data Collection (Chen, et al., 2011), the equivalent perinatal data collection used in NSW. The authors go on to determine that

using multiple data sources via linkage increases accurate ascertainment of data and a higher incidence of reporting. Unreliable data related to the diagnosis of obstruction of labour, as well as inaccuracies reported for augmentation of labour, failed instrument delivery and manual removal of the placenta, were findings in a study conducted by Roberts et al. (2009). The study validated data from the NSW Midwives Data Collection via linkage to the admitted client data collection (APDC). However overall there were high levels of accuracy. Previous research by these authors found that ascertainment of pregnancy hypertension varies by mode of delivery with higher levels of missing data in this field in the NSW Midwives Data Collection for women having an elective caesarean section (Roberts, Lain & Hadfield, 2007). It should be noted that these studies are quantitative in nature and focus on validation of data rather than on underlying factors that influence data collection and entry.

Robertson's study (1996) validated quantitatively the use of paper perinatal data forms in Victoria, Australia, and examined the causal factors. Findings were used to inform a training program implemented for staff in an attempt to address matters of accuracy. Through qualitative investigation, the study identified issues with data entry such as confusion over perinatal definitions, underreporting relating to perceived sensitiveness of information and transcription errors (Robertson, 1996). However, no follow up research into these issues for midwives Australia wide could be found in the literature. Although the literature offers some views into midwives use of ICT, none specifically addresses the needs of midwives entering perinatal data (Craswell, Moxham & Broadbent, 2013e). Clearly a gap in the literature has been identified which this research fills.

## **Electronic Perinatal Data Collection in Queensland**

In September 2009, after a short trial over a twelve month period in some health care facilities across Queensland, an online perinatal data form was introduced to selected maternity and neonatal units to replace the paper perinatal data form (Data Collection Unit, 2009). The online version contains field validations that control the data entered into certain fields, in an effort to reduce the number of errors and omissions that were submitted historically via paper forms. Field validations set parameters that define numerical or alphabetical field data requirements and date ranges, and that prevent forms from being submitted electronically when data is absent from mandatory fields. An example might be the infant's date of birth being entered using a date prior to the date of admission of the mother. The validations set for the online form would not accept this and require it to be changed prior to submission as a complete record. Although this online form has reduced the number of errors and omissions as determined by the validations used by the perinatal data unit (Data Collections Unit, 2011), these program validations cannot control the correctness of the data. Such correctness is known as data integrity.

Other hospitals in both the public and private sectors in Queensland, where data is entered into a HIS, may submit their perinatal data via an extract. This means that data fields are identified within the system as providing the items for perinatal data collection and are extracted from the HIS and sent to the Data Collection Unit of Queensland Health at the required intervals. Issues and problems related to this method of perinatal data collection occur in relation to field definitions. This is often because

the HIS field definition does not exactly match the perinatal data requirements. Additionally, these systems do not always have a validation function and this can result in fields being left empty, thus decreasing the completeness of the data. When data entered into any online system does not match the data sources in the medical record, the many and varied services that the perinatal data collection provides information for, which include funding, are placed at risk. This duplication of data is costly for service providers as well as time consuming for midwives in their already busy workload. The move to electronic collection is an enormous change to the process of recording perinatal data in Queensland. Inevitably, such a change brings with it modifications in workflow and organisational practices within maternity units, particularly for the midwives who are entering the data. Since the move to electronic collection, the issues for midwives entering the data have not been examined in the literature. It was the aim of this research therefore, to fill that gap and provide an understanding of the factors that influence midwives interaction with the computer when collecting and entering perinatal data.

### **Mandatory use systems**

When describing the process of perinatal data collection and entry, any software system for entering perinatal data in Queensland, Australia is a ‘mandatory use’ system. This compares to other systems being used throughout midwifery units and elsewhere in healthcare institutions that are ‘voluntary use’. Voluntary use systems include such technology as the Internet for finding evidence based practice research, intranet within the healthcare institution, and pathology results software. There remain other options to

using such systems including choosing not to use them that still allow the midwife to fulfil the responsibilities of their role. Given the mandatory nature of perinatal data collection though, midwives are required to use the system installed at their institution for entry of perinatal data for mothers and babies in their care. It is important to note, and with risk of labouring the point, that there is no other method available to them, for recording and submitting the data. This situation means that there is no choice for them in this matter and that use of the ICT system provided is the only means of meeting the job requirements (Hennington, Janz & Poston, 2011).

The literature is replete with discourse that within business and particularly in healthcare, computerisation of work practices that were previously performed manually is becoming increasingly prevalent (Guo & Zhang, 2010; Koh, Prybutok, Ryan & Wu, 2010; Rawstorne, Jayasuriya & Caputi, 2000; Ridgway, Mitchell & Sheean, 2011). The issue of whether a midwife complies with a mandate for compulsory entry of perinatal data is not the focus of this research, but certainly worthy of investigation, because failure to comply may bring about negative consequences for that midwife and the health care data set. Such mandatory and voluntary use systems are debated in the literature within the existing theoretical models, which explain ICT use.

### **Theoretical models relating to the use ICT**

There are several models within the literature that relate to the use of ICT in healthcare. The Technology Acceptance Model (TAM) developed by Davis (1986) is an adoption of the Theory of Reasoned Action by Fishbein and Ajzen (1975). It is tailored

specifically for modelling user acceptance of information systems and is the most often cited, being considered to be the leading theory of technology use with significant empirical evidence to support it (Venkatesh & Smith, 1999). The TAM is built on predictors of intention to use technology, perceived usefulness and perceived ease of use. As this theory is about intention to use, its applicability is limited in mandatory use environments such as the systems for perinatal data collection that are examined in this study. This is similarly asserted by Callen, Braithwaite and Westbrook (2008), who were also publishing in the field of mandatory use systems. Criticism for the adaptation of TAM for mandatory use systems is abundant in the literature, with several authors attempting to adapt TAM for mandatory use ICT with equivocal success (Burgess & Sargent, 2007; Holden & Karsh, 2009; Mather, Caputi & Jayasuriya, 2002; Rawstorne, et al., 2000).

Other theories used to describe the use of ICT within healthcare include the Theory of Planned Behaviour (Ajzen, 1991), Rogers Innovation Diffusion model (Rogers, 1995), Benner's Novice to Expert theory (Benner, 2001), and a combination of features of them all including TAM, known as the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, Morris, Davis & David, 2003). Each has some applicable, as well as limiting factors for using in mandatory use systems such as those computerised systems for perinatal data entry described in this research.

The Theory of Planned Behaviour (Ajzen, 1991), like TAM, builds on the Theory of Reasoned Action and has been used to explain the users intention to employ ICT, but again it is limited in its applicability for mandatory use systems. Contributing measures

of user attitude, subjective norms and perceived control of their behavioural intention to use a system when they are mandated to do so make it difficult to translate results across systems.

Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, et al., 2003) has been applied to the use of ICT aiming to explain user intentions to use and subsequent usage behaviour. This theory is based on review and consolidation of the following - Theory of Reasoned Action (TRA), TAM, Motivational model, TPB, combined TPB and TAM, model of PC utilisation, Innovation Diffusion theory and Social Cognitive Theory (Burgess & Sargent, 2007). UTAUT differs from TAM in the time in which review of the information system occurs. However the use of this theory is limited in mandatory use systems based on one of the key constructs being voluntariness of use which is seen to influence another key construct, the users behavioural intention. Where use is mandatory, there is no measurement for this element.

The adoption of technology by midwives, nurses and other healthcare workers has been studied in the literature using Rogers Innovation Diffusion model (Rogers, 1995). This model proposes that people possess differing degrees of willingness to adopt innovations and therefore the portion of the population who adopt an innovation is approximately normally distributed over time (Rogers, 1995). The model identifies the fact that users fall into groups. These are one of: innovators, early adopters, early majority, late majority and laggards. The model also suggests that the rate of adoption of innovations is impacted by five factors as listed in Table 3 below.

Table 3: Rogers Innovation Diffusion Model - factors influencing rate of adoption of innovation (Rogers, 1995).

1	relative advantage
2	compatibility
3	trialability
4	observability
5	complexity

Application of Rogers’ Innovation Diffusion model to ICT use within healthcare was found to accurately describe nurses’ behaviour during the process of adopting a workplace innovation - a computerised nursing care plan (Lee, 2004). However, along with TAM, the Theory of Planned Behaviour and UTAUT, are again not applicable in mandatory use environments as adoption is a requirement not a choice.

Benner’s Novice to Expert theory (Benner, 2001) is used in scholarly literature to explain ICT competence and literacy within healthcare systems (Turner, 2010). The adaptation of this theory to ICT purports that the user moves through five levels of skill in using ICT – novice, advanced beginner, competent, proficient and finally expert (Turner, 2010). As the ICT user progress through these skill levels, the goal is an improved attitude toward use of the system. Novice users and advanced beginners will have the highest number of errors and require the most training. Proficient and expert users move to a stage where they understand that the system has a purpose.

As can be seen, there are a variety of theoretical models used to explain usage of healthcare ICT, however, many of these do not adequately explain mandatory use

systems. This research adds to this body of knowledge forming the theoretical underpinnings of healthcare ICT.

## **Summary**

Currently perinatal data is collected on all mothers and their babies born in Queensland. It is recorded by midwives using a mandatory ICT system as part of their daily work. The introduction of ICT into healthcare is believed to improve efficiency; however, the reality is that the literature supporting this contention is not yet available.

This chapter presented the literature surrounding the use of ICT by nurses and midwives. Literature analysis revealed a positive attitude to the use of ICT within the workplace. However, lack of confidence in using ICT, barriers to successful use of ICT and the need for education and training take precedence in the discourse, thus highlighting a gap. The chapter then discussed when and why perinatal data was introduced, tracing its history in Queensland and the movement from paper collection to the use of ICT and data entry by midwives. Discussion of the literature concerning data quality was presented suggesting that variable quality exists both worldwide and within Australian population data sets, and more specifically within perinatal data collections. Then mandatory use systems were addressed and finally discussion is presented of existing theoretical models to explain ICT use. A gap in the literature examining the factors that influence midwives interaction with the computer when collecting and entering perinatal data was identified and as alluded to, aims to be filled by this research.

The following chapter presents the research design in detail. It describes Grounded Theory the methodology used in the research and explicates the associated methods used in undertaking this research. It also discusses the credibility and dependability of this research and the ethical considerations made in the process of accomplishing the study.

## CHAPTER 3 – RESEARCH DESIGN: METHODOLOGY AND METHODS

Chapter 2 provided the significance and setting for this study as posited within current literature. The aim of this chapter is to provide a rich description of the research design. The focus is on Grounded Theory methodology and the related methods used for this research. The chapter begins with an explanation of Grounded Theory as well as evolution since its discovery in the 1960s. This is followed by a discussion regarding the relationship of Grounded Theory to nursing and midwifery research, and specifically how it applies both to this research and the researcher's worldview. The methods used for the research are then presented which include; the research question, participant attributes, data collection and analysis. Finally, the credibility and dependability of the research is discussed, concluding with addressing ethical considerations.

### **Grounded Theory**

Grounded Theory as a research methodology was pioneered by sociologists, Barney Glaser and Anselm Strauss while conducting research into death and dying, resulting in their publication of *The Discovery of Grounded Theory* (Charmaz, 2006; Glaser & Strauss, 1967). They found that existing theories used in research were poorly suited to the participants under study, and they aspired to provide a means for the theory to emerge from the data (Creswell, 2007). Utilising Glaser's background in quantitative research and Strauss's background in social science, they combined their talents and developed a new method of qualitative analysis at a time when qualitative methodology

was viewed with caution within the research community. Their focus was development of theory building, grounded in the data that has been systematically collected and analysed, using constant comparison as the central feature of the method. Constant comparison requires that data is collected and analysed simultaneously, with each piece of data being compared with every other piece of data, codes, and then categories, until the theoretical framework is generated (Cutcliffe, 2000).

The philosophical foundations for Grounded Theory are widely reported as stemming from sociology, with the assumption that meaning can be understood from examining social processes (Blumer, 1986). Early texts by Glaser and Strauss do not expand into ontological description of Grounded Theory although later editions of Strauss' work, which he did with Juliet Corbin, demonstrate some reference to such description (Birks & Mills, 2011). Glaser denies a philosophical grounding for Grounded Theory but his writing has led authors to believe that his underpinning philosophy comes from a post-positivist paradigm (Birks & Mills, 2011) within the ontology of critical realism (Urquhart, 2001). Strauss's work and the later work he did with Corbin stems from a philosophy of symbolic interactionism, an exploration of interactions between people's social role as opposed to their environmental responses (Strauss & Corbin, 1990).

Grounded Theory inquires into how social processes influence how things are accomplished, incorporating changes in response to evolving conditions and the participant's ability to control their destiny (Benoliel, 1996; Strauss & Corbin, 1990, 1998). Grounded Theory emphasises the development of a theory as being necessary to gaining deeper knowledge of the social phenoma under study (Minichiello, Sullivan,

Greenwood & Axford, 2004). Many authors define the essential components of any Grounded Theory as:

- Initial coding and categorisation of data
- Concurrent data generation or collection and analysis
- Memo writing to elaborate the properties of categories, and their relationships with other categories
- Theoretical sampling
- Constant comparative analysis method
- Theoretical sensitivity
- Intermediate coding
- Identification of a core category

(Andersen, Inoue & Walsh 2013; Evans, 2013; Glaser, 1998; Stern & Porr, 2011)

In addition to the above components, the review of the literature is conducted at the end of theoretical development rather than at the beginning of the project (Glaser, 1978). Glaser believes the literature will obscure the researcher's view of the substantive area with existing theory by conducting a literature review before collecting data in the field. However, reading around the research area prior to its undertaking is acceptable to Grounded Theory methodology (Andersen, et al., 2013; Charmaz, 2006; Strauss & Corbin, 1990), and as it is important for research conducted for a PhD to contribute to new knowledge (Arnold, 2005). A cursory search ensures the originality of the research.

## **Evolution of Grounded Theory**

Following publication of *The Discovery of Grounded Theory*, Grounded Theory methods have undergone iterative development by the founders, Glaser and Strauss, as well as by subsequent research scholars. This has resulted in the evolution of different approaches to the methodology and related methods. Glaser has remained devoted to the original Grounded Theory methods focusing on constant comparison and emergence, arguing that Strauss' later developments with Corbin forced the data, leading the method to become overly structured (Glaser, 1992). Glaser believed Strauss' latter version was no longer true Grounded Theory, but what he regarded as full conceptual description (Heath & Cowley, 2004). This resulted in major published disagreements between the original authors, with Glaser penning an entire book in response to Strauss and Corbin's 1990 publication, entitled: *Basics of Grounded Theory analysis: Emergence versus Forcing*, in which he refuted their methods (Glaser, 1992; Strauss & Corbin, 1990). Stern (1994) states that these differences were seen by others during their original study into death and dying, but only became apparent to Glaser while writing his book of amendments in response to Strauss and Corbin's new work. This realisation by Glaser is stated in his amendments. "What has started out as a book of corrections ended up showing that Strauss indeed has used a different methodology all along, probably from the start in 1967..." (Glaser, 1992, p. 122). The techniques developed by Strauss and Corbin apply much more structure to the method through the development of categories. They use axial coding and suggest development of categories within the areas of conditions, context, action and interaction (Strauss & Corbin, 1990, 1998).

Second generation Grounded Theorists such as Adele Clark and Kathy Charmaz, have developed iterations of the original method moving away from its post positivist origins and emergence, towards theory generation and construction (Birks & Mills, 2011). Clark was trained by Strauss and extends his work on Grounded Theory, (co-authored with Corbin), into situational analysis. She utilised maps - situational, social worlds and positional - as fresh ways to look at the data and supplementary to traditional Grounded Theory methods. Clark (2003, p. 554) states that "...the analyst constructs the situation of inquiry empirically. The situation per se becomes the ultimate unit of analysis and understanding its elements and their relations are the primary goals".

Charmaz's (2006) landmark work on constructivism, features acknowledgement of the researcher's impact on the research and the placement of the researcher in relation to the participants, and encourages recognition of the researcher's influence over the research outcomes. Like the work of Strauss and Corbin (1990), these iterations are seen to have made Grounded Theory more accessible to novice researchers (Urquhart, Lehmann & Myers, 2010; Urquhart, 2013). There is no doubt that the popular and ongoing use of Grounded Theory in research will continue to develop and further alter the methodology. The reality of the major divergence in approach by Glaser and Strauss, as well as the continuing evolution of the method for researchers using Grounded Theory, is a need to understand from which point of reference the researcher comes from and to be aware of which version is being used (Heath & Cowley, 2004; Urquhart, 2001). The following is therefore a discussion of Grounded Theory within nursing and midwifery, and more specifically which Grounded Theory approach was used in this research.

## **Grounded Theory and this research**

Given that Glaser and Strauss were working within the University of California, San Francisco, School of Nursing during their discovery and publication of the seminal Grounded Theory text, it comes as no surprise that the use of Grounded Theory is popular among the nursing profession and has had a significant impact on nursing research (Andersen, et al., 2013; Elliot & Lazenbatt, 2005; Mills, Bonner & Francis, 2006). Due to the nature of nursing and midwifery and its interconnectedness with social interactions, Grounded Theory is seen as an appropriate and valuable methodology for use in nursing (Benoliel, 1996; McCann & Clark, 2005). Grounded Theory is also seen as appropriate for analysing process, and Charmaz (2006), states that the classic Grounded Theory text of Glaser and Strauss provides an explicit method for achieving this.

In this research, the Grounded Theory approach used is that which encompasses qualitative data as a qualitative methodology stemming from the post positivist paradigm. This approach is most commonly attributed to the work done by Glaser and is referred to as Glaserian or classical Grounded Theory (Stern, 1994). Despite approaching this research utilising classical Grounded Theory, it is still not exactly as Glaser asserts. Wasserman, Clair and Wilson (2009) group themselves with other Grounded Theory authors such as Bryant, Clarke and Charmaz in stating that Grounded Theory methodology will be merged with new analytic techniques and continue to grow and change over time. "... how the Grounded Theory guidelines and assumptions are used is not a neutral process" (Wasserman, et al., 2009, p. 357). During the process of

undertaking this research, such growth and change have occurred and the methods used have diverged in this way from the initial use of classical Grounded Theory to incorporate parts of other authors' iterations. The area of interest in this research came from the researcher's experiences in the disciplines of nursing, midwifery, information management and training. This is now explained in more detail.

### **The researcher's worldview**

Although academic writing has traditionally been done in the third person, for this section, specifically about the worldview of the researcher, first person has been used to better communicate the origins of the project to the reader. It is suggested that hearing the authors voice in the text helps the reader to participate in the research as well as making the research more real (Holloway, 2005).

The term worldview, which may also be called paradigm, epistemology, ontology or alternative knowledge claims, relates to the philosophical assumptions and beliefs that researchers bring, all of which have a function in shaping and informing the research (Creswell, 2007). My worldview or paradigm has been influenced by the fact that I am a registered nurse (RN) with clinical experience in paediatrics, midwifery and neonatal nursing. Additionally, in 2001, I completed a Bachelor of Arts in Information Management focusing on database design. Soon after that, I gained a position in a maternity unit with responsibility for migrating data from paper perinatal data forms to a midwifery database. This position involved teaching midwives to use an obstetric database as well as writing training materials pertaining to this database for use by staff.

Throughout the time that I held this position I observed midwives using technology, and identified issues of incompleteness and, witnessed inaccuracy with the paper perinatal data forms. These incomplete data sets subsequently affected the data entry I was undertaking. In talking to health information managers and midwives who were involved in correcting paper perinatal data forms, the question was raised of why information in the paper medical record differed from information in the paper perinatal data form arose. It was at this time that I felt these differences were worthy of exploration. I remained in the clinical environment and in several hospitals I worked at subsequently witnessed perinatal data collection move to online platforms and wondered if this had improved the level of accuracy and completeness. At the same time, I also wondered how nurses and midwives were experiencing this new technology, having seen them struggle with the obstetric database. From this position, my interest in this research was born, represented graphically in Figure 7.

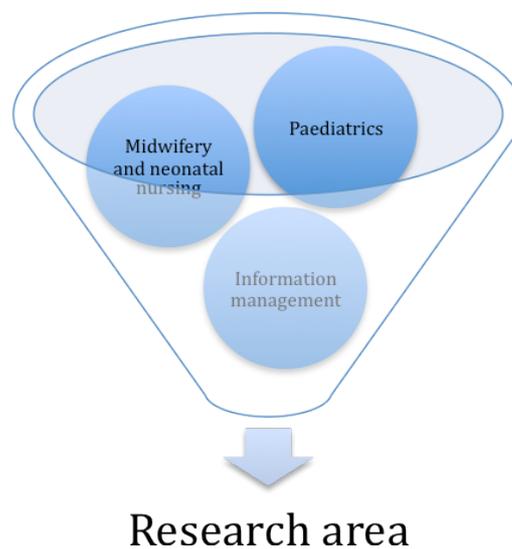


Figure 7: Worldview to research area

With growing interest in this area, I undertook a scoping of the literature and found quantitative studies that examined accuracy in perinatal data collections. Rather than do yet another large study measuring accuracy, I felt it was important to understand the problem from the point of view of those people who were living with the data and the forms; the midwives. I therefore believed that asking midwives to speak in their own words about their processes and experiences of entering perinatal data into a computer, would assist in understanding and then explaining this phenomenon. My own worldview therefore, brought with it some insights. Methodologically, Grounded Theory is supportive of the researcher gaining some theoretical sensitivity from their previous experiences (Finlay, 2002) and is also a well-accepted method for undertaking research in areas where very little research exists (Glaser, 1978). For these reasons, Grounded Theory was considered the methodology of ‘best fit’ for this research. I aimed to not only examine and describe the process of perinatal data collection from the point of view of those entering the data but also to explain it through the development of a substantive theory.

Chen and Boore (2009, p. 2251) state that: “There is a major need for the development of more theories that are intimately tied to nursing practice”. Crozier, Sinclair, Kernohan and Porter (2007) similarly report that there is little theoretical exploration of the work of the midwife. In addition to this, Urquhart (2007) believes the theory-building aspect of Grounded Theory methodology within the information systems discipline remains scarce in its application. This research is a combination of aspects of these two areas encompassing midwives and perinatal data collection, and the entry of the mother and baby’s data into a computer system. A Grounded Theory approach

offered a means of developing a deep understanding presented through a theory; one that comprehensively explains this phenomenon as demonstrated in this thesis.

The next section outlines the research aim and question and also discusses how specific Grounded Theory methods were used in this research.

### **Research Aim and Question**

The aim of this research was to understand the factors that influence midwives interaction with the computer when collecting and entering perinatal data. To achieve this aim the following research question underpinned the research design:

Q: What are the influences on midwives during the process of collecting and entering perinatal data?

This open question was developed in a manner that encouraged a reflective response from participants as well as giving a depth to the information. A reflective response is valuable because the participant tells his or her story in their own words after some thought about the question (Roulston, 2011). This broad question was posited at the beginning of the individual in-depth interviews and was used to open the participant/researcher dialogue. An open-ended questioning style encouraged participants to elaborate on their responses rather than providing a structured ‘yes or no’ answer. It also enabled the participants to give their opinions freely and openly. Glaser (1978) was specific about the researcher not defining a research question, asserting that investigating around an area of interest while collecting data would uncover relevant questions from within the data. As a novice researcher undertaking a Doctor of

Philosophy (PhD), constructing a research question in this way was important to allow freedom to explore the research area while providing a focus to contain the project within the parameters of the PhD research apprenticeship. As predicted, interviews progressed and questions evolved in relation to the analysis (Tavakol, Torabi & Akbar Zeinaloo, 2009).

### **Grounded Theory Methods**

Regardless of the philosophy behind the variant of Grounded Theory used, the set of methods to achieve this is essentially shared (Birks, Chapman & Francis, 2008; Charmaz & Bryant, 2010). The process of undertaking Grounded Theory research includes the following:

- initial purposeful and then theoretical sampling for participants
- initial coding and categorisation of data
- concurrent data collection and analysis
- field notes
- memoing
- constant comparative analysis
- theoretical sensitivity allowing emergence of the data
- intermediate coding
- identification of a core category
- advanced coding
- resulting theory integration and explanation (Stern & Porr, 2011).

Figure 8, demonstrates how each of these steps are interrelated and how the repetitive revisiting of each level of data analysis leads to the development of a substantive theory. The use of circular shapes with arrows demonstrates how each step occurs only in conjunction with every other step and how the data is revisited cyclically during collection, analysis and theoretical development.

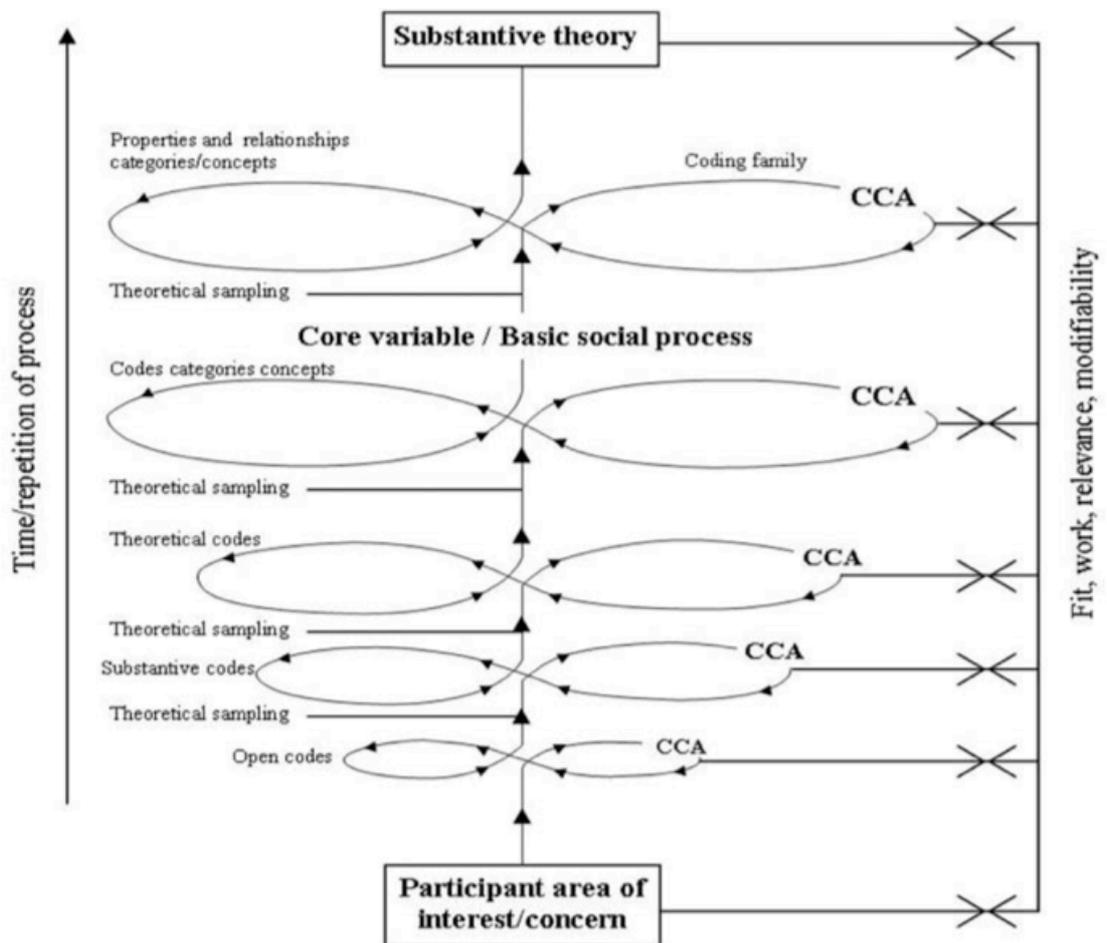


Fig 8: Grounded Theory methods (Andersen, et al., 2013)

The size of the elliptical arcs moving from small to large as the analysis moves from initial coding to substantive theory, demonstrates the increase in data available for

comparison and conceptualisation. Abstraction of the data increases as the researcher moves up through the constant comparative process (Andersen, et al., 2013).

Grounded Theory is an inductive method of concurrent analysis and collection of data for the purpose of explaining a phenomenon through theory development (Andersen, et al., 2013; Creswell, 2007). Throughout this process, memos act as an audit trail. This contributed to the study's credibility, via recording of the researchers analytical leaps during the process of data analysis, defining properties of codes and categories as well as the ensuing relationships with other codes and categories. Constant comparative analysis is central to the process of doing Grounded Theory and involves the researcher comparing data with data, data with codes, codes with other codes, codes with categories and back to data until, saturation occurs and no new data is uncovered (Stern & Porr, 2011).

While constant comparative analysis is seen by many authors to be central to Grounded Theory, consistent writing of memos provides the researcher with an opportunity to be reflexive and enhance the process and outcomes of the research (Tan, 2010). Development of theoretical sensitivity by the researcher during immersion in the data enables him or her to become so familiar with the information, that the fine distinction between emerging concepts is readily apparent. Higher level coding then occurs as a precursor to theoretical development as well as identification of the core category to which all the other categories relate. The consistent writing of memos continues throughout this process with theoretical memos resulting from the researchers analytical activity. Glaser (1998, p. 178) states that theoretical memos capture the “meaning and

ideas for one's growing theory at the moment they occur". At this point, a theoretical framework is generated by the researcher, the gaps in which are filled by theoretical sampling of participants for specific data to be gathered which will flesh out the theory. Once this occurs, data saturation is reached and only then is it advisable that the researcher goes to the literature as a source of data to assist in theoretical development and explanation (Glaser, 1992). A Grounded Theory therefore begins with the data, thus the expression grounded in data, which in this research resulted from interviews with participants. The next section will describe the process of recruitment and selection of participants who provided the data during a series of individual in-depth interviews.

## **Participants**

Recruitment began by utilising purposeful sampling (Cutcliffe, 2000). This is a form of non-probability sampling, and can be defined as a process in which the researcher selects participants who experience the phenomenon under study (Oliver, 2006). Grounded Theory methodology requires that participants have experience in the area of interest, in this case perinatal data collection and online entry of data. Initial participants were those who used an online perinatal data collection system and were recruited via word of mouth through contacts at local healthcare units and through conversations between the researcher and interested parties at several conference presentations. This initial purposeful sampling is congruent with Grounded Theory methods (Birks & Mills, 2011; Cutcliffe, 2000). Criteria for participant selection are listed in Table 4.

Table 4: Initial criteria for participant selection

<b>Initial criteria for participant selection</b>
<ul style="list-style-type: none"><li>• Holds current registration as Midwife in Australia</li><li>• Worked as RN and/or Midwife for &gt;5 years</li><li>• Worked in Queensland and in current place of employment &gt;2 years</li><li>• Used a computer for perinatal data entry &gt;12 months</li></ul>

Given that participants were needed who were best situated to contribute data to explore the research question, these criteria aimed to preclude midwives who were new to the profession, new to the workplace and new to the information system for entering perinatal data. The criteria of 12 months or greater experience using a computer for perinatal data entry was included because some studies have reported that six months to twelve months was insufficient time for RNs and midwives to show mastery of the use of a new nursing information system (Larrabee, et al., 2001; Ward, et al., 2008). Selecting participants from Queensland aimed to identify participants working in maternity units that fed data to the Queensland Health Data Collections Unit, rather than other units within Australia, which have different mandatory items and different methods of data collection.

Because this research utilises qualitative methodology, individual in-depth, semi-structured interviews were conducted with 15 participants. This enabled deep discussion around the research topic and time and attention were allowed for each participant to

give a reflective response. Focus groups were not used because the research aimed to provide confidentiality for participants, encouraging their confidence to tell their story without fear of appearing less computer literate than other possibly more skilled colleagues. Focus groups carry a disadvantage in that the stronger more opinionated members may influence others and dominate the discussion (Creswell, 2007). Adhering to Grounded Theory methods, the sample size was not pre-determined but influenced by saturation of the data rather than a specific required number of participants that would meet generalised sampling requirements (Pope, Ziebland & Mays, 2000). Saturation of the data occurred when no new information emerged from interviews and the theoretical framework was sufficiently populated via theoretical sampling, to explain the phenomena under study (Fernández, 2004).

At the end of some of the early interviews, the initial participants provided contact details of other midwives who met the inclusion criteria. Using this process, referred to as snowballing, recruitment of further participants occurred. Snowballing commences with a few participants from a convenience sample, (in this case purposeful), then suggest others who may be useful to the research (Auerbach & Silverstein, 2003). It is considered an appropriate recruitment technique in Grounded Theory, as only those with specific experience within the area of research can provide insight (Bluff, 2005). Theoretical sampling was then adopted and persons having certain characteristics in line with the developing theory were contacted. At the conclusion of data collection the 15 participants came from twelve different hospitals across Queensland and had in total used three different systems for entering perinatal data.

All of the participants interviewed were users of a system for perinatal data entry, and all were registered midwives and women. No RNs working in maternity units volunteered to participate in this research. In Queensland most maternity units, which can be made up of antenatal clinic, birth suite, post-natal ward and special care nursery (SCN), are staffed wholly by midwives. Almost half of the participant group had an additional role as the perinatal data coordinator for their clinical unit. Such is the significance of perinatal data, that the role of the perinatal data coordinator specifically encompasses entering perinatal data for mothers and babies in the same manner as other midwives. In addition they validate the data for each entry at the end of month. In some instances this coordinator also checked data, corrected errors, completed incomplete entries and responded to error reports that had resulted from the previous month's data. The role also incorporates extracting the data to send to the perinatal data collection unit of Queensland Health. During data analysis it became clear the initial participant inclusion criteria were not broad enough to encompass the wide variation of users of perinatal data collection systems. Therefore, as mentioned above, using theoretical sampling within Grounded Theory required that participants who had differing experiences of online perinatal data entry should be recruited in order to populate the developing theoretical framework. The various roles of the participants can be seen in Figure 9.

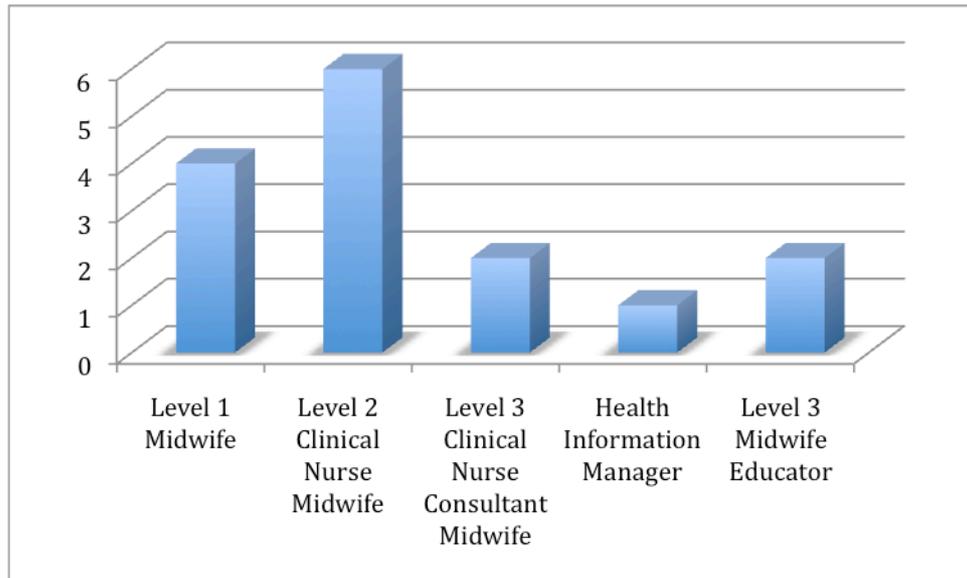


Figure 9: Participant roles

Participants held positions at both private and public maternity facilities in Queensland and worked in metropolitan, regional and rural areas of the state. Expanding the participant criteria was crucial in order to fully explore the many dimensions of the phenomenon under study (Coyne, 1997); in this case understanding the factors that influence midwives interaction with the computer when entering perinatal data. To alter the initial selection criteria, an ethics amendment was applied for to provide the opportunity to recruit three additional participants. Ethics approval was granted and a participant who was working as a perinatal data coordinator, but was no longer registered as a nurse or midwife, and two others, who had worked in their current place of employment for only twelve months, were recruited. Data from these participants contributed to the emerging theoretical framework and the ultimate arrival at data saturation (Glaser, 1978; Glaser & Strauss, 1967).

## **Data collection and analysis**

In-line with Grounded Theory methods, data collection and analysis were done simultaneously (Birks & Mills, 2011) and for that reason are discussed together. Through initial reading of the literature around the research topic, as well as the personal interest and experience brought to this research as outlined earlier, theoretical sensitivity developed. Theoretical sensitivity is conceptualised as the researcher being able to ‘see’ concepts in the data that relate to the emerging theory. Development of this theoretical sensitivity by the researcher enabled a heightened sensitivity to the data, as well as acknowledgment of existing prior opinions (McCann & Clark, 2005). The time of the in-depth, one-on-one interviews was determined by the participant, but due to the tyranny of distance involved between cities and towns in Queensland, on only two occasions did interviews occur face-to-face. All interviews occurred at a time nominated by the participants, which usually meant outside of the clinical work hours. Participants said they chose these times to avoid disturbances in relation to their work. Participants were not being interviewed as employees of a particular hospital but ‘simply’ as users of a system to enter perinatal data.

## **Interviewing and its challenges**

The two face-to-face interviews were both conducted early in the data collection phase. The nuances of the participants as well as being relatively new to interviewing despite spending many hours practising, led to the researcher compensating for silences by using verbal and non-verbal encouragement. When reading and transcribing these interviews, it became obvious that there were inadvertent interruptions to the

participants' flow of thought as well as words interjected into long silences, which in hindsight could have been instances of the participants re-ordering and arranging their thoughts to possibly go on to say something more. This reflection was an important part of research training and the memos on the interview technique and resultant learning led subsequent interviews being more fluid and having less instances of these issues.

Phone interviewing presented even more of a challenge (Novik, 2008; Shuy, 2001; Wallace, 2005), and initially being unable to see the participant and read non-verbal cues along with the often-long silences over the phone contributed to the researcher feeling uncertain about whether the participant had finished speaking. In learning from the early face-to-face interviews, caution was employed not to interrupt the participant or break their train of thought. These 'teething issues' diminished with experience and on-going practice with research supervisors, leading to the final two thirds of the interviews being much easier. This was evidenced in the transcribing process. Interviewing, whether by phone or face to face, is quite a skill (Novik, 2008). Throughout the interviews, previous experience with perinatal data collection and several systems for the online entry of data proved very useful. The use of relevant terminologies in interviews as well as an appropriate understanding in requesting clarification made the process more fluid. This also increased interviewing confidence while creating a sense of connectedness with the participants.

As the research aim was to understand the factors that influence midwives interaction with the computer when entering perinatal data, it was not necessary to collect data on the place of employment. Neither was data collected on the particular software system

or hardware used, as this was also not the focus on the research. This again assisted in keeping the location and possible identification of participants confidential. All interviews were recorded with participant permission and later transcribed verbatim by the researcher. This process took many hours but assisted in deep immersion in the data. The transcripts were checked for completeness and accuracy against the recordings and then analysed using constant comparative analysis.

### **Coding and analysis**

Unlike many early authors of Grounded Theory research, the researcher had access at the outset of the project to the many iterations of the method that have evolved over the almost 50 years since the initial “discovery” of Grounded Theory by Glaser and Strauss (Birks & Mills, 2011; Urquhart, 2001). This enabled perusal of each method to determine which iteration was best suited to the researcher as well as to the research. Advice from the literature for novice Grounded Theorists is to determine the philosophical position taken (Birks & Mills, 2011; Urquhart, 2001; Whittenmore, Chase & Mandle, 2001). As discussed previously, when alluding to cognitive fit, it was determined that the researcher was of a post-positivist stance. For this reason, classical or the Glaserian approach to analysis was used, and initially open coding line by line was undertaken as recommended by Glaser (1992).

From the interviews conducted with the group of 15 participants outlined above, initial or open coding of transcribed data was conducted using mainly ‘in vivo’ codes, and the writing of early memos. Charmaz (2006) defines ‘in vivo’ codes as those that preserve

the participants meanings by the use of their own words. Glaser (1978, p. 57) suggests that the researcher ask questions of the data including:

- “What is this data a study of?
- What category does this incident indicate?
- What is actually happening in the data?”

As described earlier in the chapter, results of this early coding gave direction for subsequent interviews and as such, further participants were theoretically sampled. Their interviews were also transcribed verbatim and coded. This latter data was compared with the earlier data using constant comparative analysis. Further memos were written and/or older ones added to and/or revised. As the data quickly grew in quantity and complete immersion in it occurred, line by line coding became more laborious. Masses of data were generated for each code, as well as the appearance that the data was being fractured in a way that changed the meaning. For this reason, coding of the latter data in larger chunks, sentences and paragraphs rather than line by line was undertaken. This occurred whilst remaining true to the classical Grounded Theory methods (Bradley, Curry & Devers, 2007) but utilising their flexibility (Urquhart, 2013; Urquhart & Fernandez, 2013). The early work of line by line coding enabled a deep examination of the data from a perspective that everything was important. This aided the research training process. Theoretical sensitivity, as it developed over the course of the analytical process, more readily facilitating the emergence of relevant parts (Glaser & Strauss, 1967).

Qualitative interviews can quickly amass large volumes of data, so, in an effort to more effectively manage the data, NVivo 9 software was utilised. This software had other

advantages including storing memos, annotations and journal entries as coding progressed. However, as cautioned by Marshall (2002), one of the issues of using software for data management is the ability to code faster and hence use more codes. Early line by line coding resulted in a plethora of codes – up to 150 at one point, which later when continuing the process of constant comparison, ended up being many different ways to say essentially the same thing. Using constant comparison, the codes were reduced and this further immersion in the data helped the structure of the theoretical framework to gain clarity.

As is meant to be the case during a PhD apprenticeship, a finding that became apparent during reflection on this process was the realisation that preconceptions and previous experience within this field had little negative effect on the interviewing style of the researcher. This was something that was initially a concern to the researcher who worried about undue influence and bias. While knowledge of current terminology and assisted in connecting with participants, any existing preconceptions were forgotten in the light of the excitement of emerging information from participants. While interviewing, the idea of being open to everything the participant had to say as well as taking care not to impose preconceptions through questioning and researcher responses was a priority, an approach conducive to Grounded Theory in line with Classical Grounded Theory methods (Glaser, 1978; Urquhart & Fernandez, 2013).

Over time, and as coding progressed, codes became themes and finally the allocation of substantive or theoretical codes occurred. In aligning with Grounded Theory Methodology, theorising via the writing of memos about the relationships between

elements and the core category was undertaken. An example of the researchers evolving ideas around a theme recorded in a theoretical memo can be seen in Appendix H, demonstrating the process of theorising up from the data in an effort to explain the relationships between the theoretical codes. This part of the systematised process, moving up from the data and conceptualising what was happening, proved personally challenging because of fear of losing the grounding in the data that is core to Grounded Theory methods. Close work with the doctoral supervisors, experienced in qualitative enquiry, increased the confidence of the researcher, enabling a move towards theoretical framework development. During this time, contact was made by email with Barney Glaser who responded with a reminder that Grounded Theory is conceptual and a suggestion to try to use less description (B. Glaser 2012, pers. comm., 10 Dec). This assisted in helping the researcher to move more confidently away from the data to a conceptual framework.

As concepts emerged from the data, the researcher undertook the process of theoretical sampling via interviewing particular participants that could provide alternative views to the process of entering perinatal data into the computer. One example of this was an interview with a midwife from a metropolitan area of Queensland in a more senior midwifery role, chosen on the basis of unsaturated categories and the potential to maximise differences with other emergent data. The unsaturated categories were within the themes of midwives role, understanding use and professional development. It was determined that the conditions for interviewing a particular participant who might fulfil these data requirements were: a midwife with specialist exposure in their work area, either birth suite, ante-natal, post-natal or nursery, those with increased access to higher

education and those already on leadership paths within the organisation. It was believed that metropolitan midwives might fulfil these ideals. Questioning during interviews changed direction in alignment with the emergent codes and categories during constant comparative analysis to assist in fleshing out the developing theoretical framework. This collection and coding process continued until very little new data was emerging from the interviews, a core category had emerged and an early framework developed from the data. To populate this framework, theoretical sampling of a further three participants, as described earlier, provided additional data. These interviews provided further rich data that saturated the categories under development. The final two interviews were conducted in the context of member checking (Whittenmore, et al., 2001) to confirm the developing theory. They resulted in both substantiation of the theory under development and confirmation of data saturation. The process of data collection and analysis took approximately ten months.

Glaser and Strauss (1967) differentiate between a substantive theory as produced for the purpose of understanding a defined phenomenon for a clearly identified group of people, and formal theory. The latter being developed to a higher conceptual level with applicability across a number of substantive areas (Birks & Mills, 2011). Most research using Grounded Theory effectively results in a substantive theory (Stern & Porr, 2011). This research has resulted in the development of a substantive theory that explains what influences midwives when they engage with the process of entering perinatal data. Credibility and dependability in the process of using Grounded Theory methods will now be discussed.

## **Credibility and dependability**

Credibility in quantitative research is judged by measures of validity and reliability (Golafshani, 2003). There is discussion in the literature about the relevance of using these same measures to judge qualitative research (Onwuegbuzie & Leech, 2007; Whittenmore, et al., 2001). Some authors consider these measures irrelevant to qualitative research, and some suggested terms to be used in their place are, credibility,, or consistency, and rigour or trustworthiness (Whittenmore, et al., 2001). These authors refer to validity as “the state or quality of being sound, just and well-founded” and therefore believe that all research can be judged from this standpoint, regardless of whether it is qualitative or quantitative (Whittenmore, et al., 2001, p. 527). In spite of the differing opinions in the literature, consensus centres around Lincoln and Guba’s (1985) translated validity criteria for qualitative research (Morse, Barrett, Mayan, Olson & Spiers, 2002). The terms they recommend in place of validity are credibility, transferability, dependability and confirmability. When auditing this research with reference to Lincoln and Guba’s (1985) strategies, credibility can be seen in a prolonged field experience, with interviews completed over a period of 10 months by the researcher as interviewer. Further, credibility is demonstrated in this research by the use of reflexivity, the influence on the research process of the interactions between the investigator and the participant (Hall & Callery, 2001). It was also demonstrated by the use of member checking, the process of returning to the participants as theoretical development was nearing completion, to check that the emerging theory resonated with them. This also enabled the checking of codes for resonance and saturation. Questioning during interviews changed as a result with brief information of the

emergent codes given to the participant resulting in interviewees either concurring or disagreeing and usually more explanation of their experience would follow.

Grounded Theory by design promotes checking emerging concepts that the researcher fears may have come from their prior knowledge and experience. This is done by constant comparison with participant responses in order to determine authenticity or representativeness (Walls, Parahoo & Fleming, 2010). A chain of evidence can be examined by looking at the development of codes from early iterations through to latter code, category and theme development including name changes and merging with other instances of data. Examples of this process for the codes around the issue of ‘Time’ can be seen in Appendix D. Dependability is demonstrated by use of the constant comparative method for data analysis and dense description of the research methods. Finally, confirmability is demonstrated by use of theoretical sampling and by close examination and use of existing literature once theory development neared completion.

In comparison to Lincoln and Guba’s (1985) methods for determining credibility in research, seminal work by Glaser and Strauss (1967) and later Glaser (1978) independently judges a Grounded Theory using fit, work, relevance and modifiability, to which Glaser later added parsimony and explanatory scope (Glaser, 1992). A description of these terms is offered in Table 5 below.

Table 5: Measures of credibility in a Grounded Theory (Glaser, 1978, 1992; Glaser & Strauss, 1967)

<b>Fit</b>	Ability of the category(ies) to relate to the issue under study as a faithful representation of the data
<b>Work</b>	Ability of theory to work with other categories
<b>Relevance</b>	Fit of the core category as emergent and in relation to participant data
<b>Modifiability</b>	Ability of core category to change when new data are applied
<b>Parsimony</b>	Use of the minimum number of concepts to demonstrate total variation in the data
<b>Explanatory Scope</b>	That all data relate to the core category and account for what is going on within the data

For a Grounded Theory to have ‘fit’, the theory is required to be a faithful representation of everyday realities of a substantive area. That is, a Grounded Theory must be carefully induced from diverse data (Artinian, 2009; Hall & Callery, 2001). The theory proposed in this research emerged from a strong foundation of data provided via in-depth, one on one interviews with a variety of participants who were cognisant in perinatal data entry into the computer, the process being researched. Participants initially were purposefully selected with this requirement in mind. They were then selected via the process of theoretical sampling, in which selection was based on participants with experience in areas needed in order to flesh out the theory (Wasserman, et al., 2009). As a result, **The Theory of Beneficial Engagement** has ‘fit’ to the everyday realities of being a midwife who is required to enter perinatal data into a computer in Queensland, Australia.

Glaser (1978) asserts that a Grounded Theory must have relevance, meaning that core problems and processes are allowed to emerge from the data. As such, the researcher is required to find the relevance of the data. The adherence to the Grounded Theory methods utilised during the process of this research demonstrates that the core category and basic social process of engagement have emerged and are firmly grounded in the data. Therefore, it is asserted that the relevance of the findings is closely linked to the data that underpins it, thus fulfilling this credibility requirement.

A Grounded Theory must work or have ‘workability’ (Glaser, 1978; Glaser & Strauss, 1967), and ability for the emergent theory to ‘work’ with the other categories. The theory should be able to explain what happened, predict what will happen, and interpret what is happening in an area of substantive or formal inquiry (Glaser, 1978). **The Theory of Beneficial Engagement** ‘works’ with the identified nine elements to explain the enhancing factors and the impediments to the process of entering perinatal data into the computer. The process of constant comparative analysis of participant data underlies the researcher’s interpretation. This led to the emergence of the theory, purported to predict what will happen if any of the identified elements are optimised – that beneficial engagement may occur.

Glaser (Glaser, 1978; Glaser & Strauss, 1967) asserts that a Grounded Theory must have modifiability, therefore allowing the user some control over its use and modification when new data are applied. As more technology moves into midwifery practice, particularly the impending electronic health records (EHR’s) and movement to a paperless environment, new data will emerge relating to use of computers by

midwives for perinatal data entry. As such, changing technological environment for midwives may also change or make redundant, the elements identified in this research, but modification of such elements with new data should however, still allow the theory to ‘work’ in moving toward beneficial engagement.

Parsimony, the use of minimum required concepts to demonstrate variation in the data, is recommended over presentation of extensive detail (Hall & Callery, 2001; Heath & Cowley, 2004). Although the length of this doctoral thesis has allowed in-depth presentation of the research at a conceptual level, with description used when necessary to ground the data in the participant quotes, parsimony in the number of categories has been achieved. This is demonstrated by presenting comparisons of early iterations of the codes and categories in NVivo with the final nine elements defined in this thesis. These can be seen in Appendix C. Explanatory scope determines that all the data related to the core category accounts for what is occurring in the data. This is demonstrated in the adherence to Grounded Theory methods throughout this research and the grounding of the findings in the data.

The design of this research deliberately went to great lengths to use the participants own words during initial coding, and then to use constant comparative analysis to refine and reduce the number of codes that were repetitive. In this way, this research closely follows the Grounded Theory process for collection and analysis of data. As such, it is a demonstration of credibility (Urquhart, 2001). Validation of this research has been further supported by the successful publication of peer-reviewed papers (Craswell, Moxham & Broadbent, 2013a; Craswell, Moxham & Broadbent 2013e; Craswell,

Moxham & Broadbent, 2014a), conference presentations (Craswell, Moxham & Broadbent, 2011, 2013b, 2013d, 2014b), invited speaker conference presentation (Craswell, Moxham & Broadbent, 2013c) and conference posters (Craswell, Moxham & Broadbent, 2012a, 2012b). Further confirmation of the quality of the findings of this research was reflected in the researcher being awarded the Branko Cesnik award for “Best scientific paper - student award” at the 21st Australian National Health Informatics Conference (HIC2013). One paper remains accepted but unpublished (Craswell, Moxham & Broadbent, In Press). Auditability of this research was also discussed with an example of early NVivo coding available in Appendix E as well as regular memoing that supports the chronology of analytic decisions made throughout the research process.

As stated by Elliot and Lazenbatt (2005, p. 52), Grounded Theory is a “package of research methods”, and this package as a whole is integral to ensuring a rigorous approach to the process of undertaking research using Grounded Theory. In keeping with this assertion, throughout this research and as described in this thesis, attention has been made to the package of Grounded Theory methods of concurrent data collection and analysis, theoretical sampling, constant comparative analysis, memoing, theoretical sensitivity and identification of a core category (Stern & Porr, 2011) in order to ensure credibility in the resulting findings and emergent theory.

Additionally, a further measure of credibility was undertaken to determine if the assigned codes were on the ‘right’ track. Sandelowski (1998) cautions the use of experts in validation of findings, descriptions, categories or meanings. With this caution in

mind, but as a novice researcher new to the use of Grounded Theory, the aim was to compare coding with coding by a supervisor, a more experienced Grounded Theorist, in an effort to increase confidence with the coding methods. An anonymous transcript was sent to the principal supervisor, experienced in qualitative research and Grounded Theory, to code independently. This was done blindly, without consultation with the researcher and the resulting codes were compared with coding done previously on the same transcript. The result was that, for the most part, the identified relevant data items were consistent, and although some coding names for the data were different, as one might expect, a similar identification of relevant items was obtained overall. This instilled confidence in the researcher that the coding was on the right track with the coding progress and promoted further data gathering and coding.

The verified process was ongoing during the constant comparison and analysis of data, and ensured the credibility of the research. Truthfulness can also be seen in this research through provision of an audit trail consisting of saved iterative NVivo computer data analysis files as well as memos both on computer and in research journals. As already stated, an example of one of these early NVivo files can be seen in Appendix C. Finally, adherence to predominately one version of Grounded Theory, that of Glaser or Classical Grounded Theory, served to increase the overall quality of this research (Cutcliffe, 2000). All research involving humans should be cognisant of research ethics. As such, the ethical considerations embedded within this research will not be discussed.

## **Ethical considerations**

Internationally, the historical development of ethical requirements for research occurred to protect the rights of individuals from mistreatment and exploitation at the hands of researchers. This was as a result of the horror of experimentation in Second World War concentration camps. Establishment of the 1949 Nuremberg code aimed to protect human research participants from abuse by declaring that participation must be voluntary and consent obtained (Carey, 2010). The Declaration of Helsinki followed in 1964. This tabled the development of research ethics committees to individually examine research proposals individually. Within Australia, the Statement on Human Medical Experimentation of 1966, issued by the National Health and Medical Research Council (NHMRC), evolved from the Helsinki Declaration as a result of national funds for medical research becoming available. The National Statement of Ethical Conduct in Research Involving Humans, the guiding statement for ethical conduct in research within Australia, was published in 1999. It is under the revised version of this statement published in 2007 that this research was conducted (Australian Government, 2007b).

The research presented in this thesis, involved human participants and was therefore conducted according to the values and principles of ethical conduct outlined in the National Statement on Ethical Conduct in Human Research (Australian Government, 2007b) and the University of Wollongong's Code of Practice: Research (Director Research Student Centre, 2007). These values and principles include, but are not limited to, respect, beneficence, justice, merit and integrity. Each will now be described in relation to this research.

Central to these values is respect, a recognition of the intrinsic value of humans (Australian Government, 2007b). In the case of this research, respect has specific application to privacy of information and empowerment of participants via the opportunity to voice their stories regarding their experiences with perinatal data collection. Effort was made throughout each interview to respect the values and culture of participants in relation to their varied locations in urban, regional and rural areas across Queensland. Offers of information for participants, such as how to access perinatal data statistics for their unit, were followed up and fulfilled in a timely manner. Interviews were conducted at a time to suit the participants and their 'voice' was respected by use of their own words, unaltered in any way. Respect for their time was demonstrated via a token gift of appreciation after their interview. Participants did not have any knowledge of this token of appreciation until after the completion of their interview. It was a 'thank-you' not an inducement to participate.

The principle of beneficence with regard to research involves the researcher being sensitive to the welfare and interests of participants and the community (Australian Government, 2007b). This was upheld in the design of the research that aimed to minimise the risk of harm to participants, as well as providing them with the opportunity to withdraw at any time. Participation in this research was voluntary involving informed consent. No participants chose to withdraw from the research. A plain English summary of results was made available to each participant on request. 12 of the 15 participants requested this be made available to them. Positive benefit of this research via potentially improving perinatal data collection may assist the wider community.

Justice is defined in the National Statement on Ethical Conduct in Human Research (Australian Government, 2007b, p11) as “...a regard for the humans sameness that each person shares with every other”. Justice elucidates the human need to be treated fairly. This was ensured through use of purposive and theoretical sampling to select participants voluntarily who would be most suited to the research. Use of the same opening question in each interview as well as provision of a platform of fairness in participation was provided. Justice is also maintained via publications of findings arising from this research being available to all, as well as a plain language summary being sent to those participants who requested one on their consent form. Participants who initially showed an interest in being part of the research but later demonstrated some reluctance were thanked and not pursued for interview so that they were not unfairly burdened with feelings of having to participate. There was no power differential in the research process as the researcher did not work in a management role in any of the participants’ places of employment.

Research requires merit and the individual researcher’s integrity to ensure the process of involving others is ethically justifiable (Australian Government, 2007b). Within this research, merit and integrity exist in its aim to contribute to the body of knowledge about midwives and perinatal data collection. In this area there is little published qualitative literature arising from midwives own words. This research has been deemed beneficial to midwifery communities by providing an understanding of the issues surrounding perinatal data collection and its entry into a computer. The findings of this research can assist those in midwifery management, nurses and midwives in informatics, and information managers, to review current practice, provide education

and contribute to improved design of information systems used to collect data in maternity units. Health information system development can therefore be modified to reflect the identified needs of RNs and midwives. The wider population will ultimately benefit from the improved quality of perinatal data collected, as this determines funding allocation, research, and education, and monitors patterns of health in mothers and babies. The merit of this research was peer reviewed for acceptance as a PhD project. This involved preparation of a comprehensive document that underwent review, including a presentation, containing reference to current literature, significance and justification of methods. Ethics approval was granted by the University of Wollongong Human Research Ethics Committee. Ethics approval number is HE12/112 and a copy of the approval documentation can be seen in Appendix F. As mentioned above, an ethics amendment was sought and gained so as to expand the participant criteria to better include data from the full array of persons contributing to perinatal data collection.

Participants were provided with an information sheet explaining in plain English as outlined in the National Statement on ethical conduct in human research (Australian Government, 2007b) the significance of the research, requirements for participation, and benefits and risks to the participant. Issues of confidentiality and anonymity were guaranteed as well as the procedure for withdrawal. A consent form was also supplied to participants, as participation required it to be signed and returned in order to validate informed consent. These forms are attached as Appendix G. The value of respect was foremost in provision of this information based on participants having an adequate understanding of the consent form and participation in research. Participants were invited and encouraged to voice any queries arising from the information sheet and

consent form, and answers to these questions were provided prior to, and then again at the commencement of, each interview. The main aim of this information and consent process was to ensure that participants had a full understanding of both their involvement in research and any potential risks when volunteering to participate. Consent forms are stored in a locked filing cabinet separately from the interview transcriptions to decrease the risk of identification of participants with their data. Specific details of the participants' demographic data and places of work are not provided in this document so as to ensure guaranteed confidentiality and anonymity. A demonstration of ethical conduct.

Transcripts and notes are identifiable by the date of interview and an assigned number. No other personal data has been collected from participants. Identifying terms such as names of places, hospitals, software or other work colleagues appearing in transcriptions have been deleted. Electronic data is stored on a computer, accessed by password only, with any hard copies stored in a locked filing cabinet. Data will be stored for a minimum of five years from the last publication arising from the data as per the University of Wollongong's *Code of Practice—Research* (Director Research Student Centre, 2007) and the *Australian Statement for the Responsible Conduct of Research* (Australian Government, 2007a). Finally, no participants became distressed as a result of participating in this research and no concerns were raised around the research process.

## **Summary**

This chapter explained the evolution of Grounded Theory methodology since its inception in 1967 by Glaser and Strauss. There was discussion of how Grounded Theory is the methodology that most effectively relates to this research and the researcher's worldview. The research aim and question were outlined before a comprehensive discussion of the research methods ensued. This included information on the participants and their recruitment, concurrent data collection and analysis as well as challenges faced and overcome by a novice researcher during this process. Finally the credibility of the process is demonstrated and ethical considerations addressed. The following chapter presents the findings.

## CHAPTER 4 – RESEARCH FINDINGS

Chapter 3 provided a detailed description of Grounded Theory methodology and the associated methods used for the successful completion of this research. The aim of this chapter is to present the findings of this research, grounded in the data that resulted from the constant comparative analysis of 15 in-depth individual interviews. This research aimed to understand the factors that influence midwives interaction with the computer when collecting and entering perinatal data. This was fulfilled by examining the influences on midwives from their perspectives, during this process.

In order to provide the reader with an understanding of the midwives experience, this chapter firstly provides a general overview, as it is experienced by midwives, of the process of perinatal data collection and the procedure of entering it onto a computer. Then a short overview of The Theory of Beneficial Engagement, which emerged from the data, will be presented. This is followed by a presentation of the core category and contributing elements. Nine elements emerged from the data that interact together to inform the core category and basic social process of **engagement**. That is, midwives engaging with the process of entering perinatal data. Each of these nine elements will be described in turn by identifying contributing themes as they emerged from the data, along with the relationships between elements. Verbatim quotations are presented within the findings, not only to reinforce their grounding in the data, but also because the quotations are both significant and well expressed. As mentioned in the introduction, all quotations are presented in *italics* with the conventions of P =

participant and I = interviewer used throughout. Words in parenthesis are added by the researcher for clarity in understanding the context of the statements. Single quotation marks are added for emphasis. The **core category** and its contributing **elements** are written in bold text. Themes contributing to each of the presented elements are underlined.

### **The process of perinatal data collection and entry.**

The researcher has contemporary experience within the industry under study, informing her understanding of the perinatal data entry process. This understanding contributed to knowledge regarding the process of collection and entry of perinatal data as it is generally experienced within a maternity unit. This knowledge is shared here to help the reader understand this process.

The task of entering perinatal data into a computer is achieved through mandatory computer system use by midwives, because it is a requirement for maternity units in Australia to complete the perinatal data for the women and babies in their care. This differs from other voluntary use computer systems that midwives can choose to utilise (or not) as part of their daily work. Within Queensland for example, the State in which this research was conducted, the Public Health Act of 2005 includes this requirement: that perinatal data be provided to the Chief Executive of Queensland Health for every baby born. The process of entering perinatal data into a computer involves the midwife having login access to whatever computer system the hospital uses to collect perinatal data. This may be the online perinatal data form provided to some state facilities or an

obstetric database or health information system (HIS). These are used both within state facilities and at some private hospitals. Once access is granted, a midwife may start to enter data in an antenatal clinic at the first presentation of a pregnant woman and then at subsequent visits. Alternatively, initial data may be first entered in the birth suite when the pregnant woman arrives in labour or after the baby is born. The type of data entered includes demographics such as name, date of birth, address, Indigenous status, antenatal history and care, and previous pregnancies. These examples represent just a few from the substantial list of required data. An instance of data fields, screen captured from one version of an online perinatal data entry form can be seen at Appendix H.

Within Queensland maternity units, items for perinatal data are most commonly collected by the midwife and written on paper in the medical record throughout the care of the birthing woman. The midwife then enters the relevant data into the computer for perinatal data collection, thus transferring information from the mother's chart. At the time of this research, paper medical records remain the primary form of documentation, even in units utilising a Health Information System (HIS). Data is transcribed into fields on the computer in response to the questions that relate to each field. The most laborious data entry requirement is after the birth of the infant. This requires entry of several pages of data. It is most commonly completed within the few hours after a baby is born, but can be left until the next shift, the next day or even later. Data may be entered at other stages during the mother and baby's admission but most often is next entered on discharge by the discharging midwife. Computers used for this data entry are most commonly located outside the birth suite and/or on the postnatal ward. Maternity

units may also have access to a computer in the antenatal clinic for data entry at point of admission.

When the midwife completes an episode of data entry at any stage of the mother's admission, they may then validate the data. This is a computer process to find any empty fields or data that fall outside the parameters set in the software for a particular field. However, not all software offers this option. An example of this could be a date of birth of a mother in the year 1920. The software has built in parameters that recognise that it would be impossible for a woman over 90 years of age to be admitted to have a baby. As a result of this inadvertent data entry, the software would query the finding immediately and indicate to the user that a correction was required.

Data is extracted on a regular basis from the system and sent to the Data Collections Unit within Queensland Health, the unit from which perinatal data is managed in Queensland. This extraction is performed by a midwife, usually one who is in the role of Perinatal Data Coordinator. This person is likely to be a clinical nurse (CN). Data is required to be submitted to the Data Collections Unit of Queensland Health within 35 days after the end of each month. Once a mother and baby have been discharged from hospital, further perinatal data is not collected. Occasionally, the date of the neonatal screen test (NNST), if not done prior to discharge, may be entered posthumously. This description of the process of perinatal data collection, contextualised by the findings, will be presented hereon in this chapter.

## The Theory of Beneficial Engagement

The systematic, constant comparative analysis of the data revealed that the core category **engagement** was influenced by a set of nine elements, namely - **accountability, valuing, adapting, perceived benefits, workload, software, shifting focus, knowledge, and data entry**. The substantive theory generated from these elements postulates that optimisation of these nine elements can lead to a beneficial engagement with perinatal data. This is visually represented in Figure 10 with each of the elements presented as a diamond and the arrows moving from red to green which demonstrates how the midwife can move towards a beneficial engagement with perinatal data entry once each of the elements is optimised.

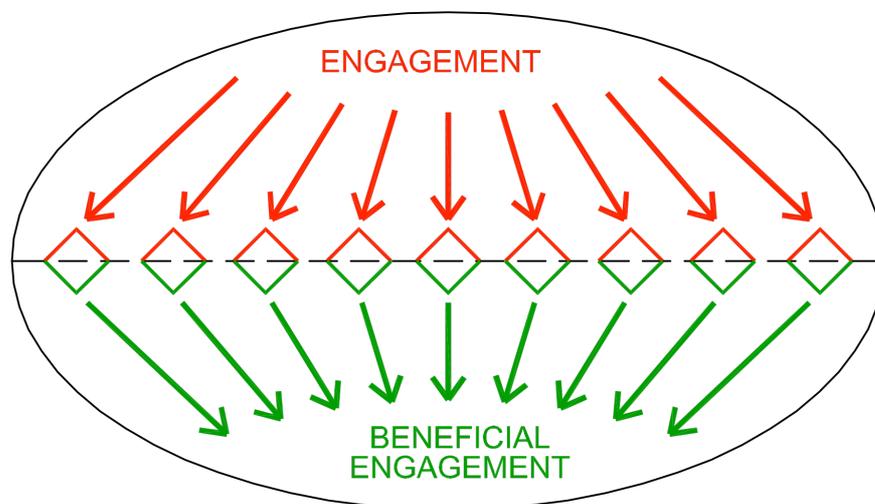


Figure 10: Theory of Beneficial Engagement

Following is a further description of the core category and the nine contributing elements.

### Core category

As described in the research design explicated in Chapter 3, the core category emerged from the data as a result of the process of constant comparative analysis as the linchpin, or point of convergence, of the data (Stern & Porr, 2011). The core category identified in this research was **engagement** and as alluded to earlier, is informed by nine elements, namely **accountability, valuing, adapting, perceived benefits, workload, shifting focus, software, knowledge** and **data entry**. This is visually represented in Figure 11. They do not represent any particular hierarchical order.

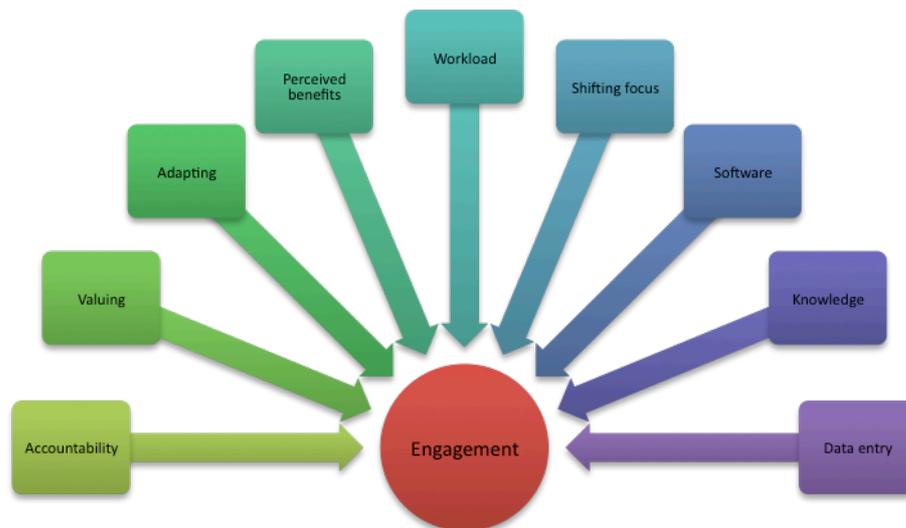


Figure 11: Elements of engagement

Analysis revealed these nine elements contribute to the participants' overall practice in relation to the process of entering perinatal data. Each element is informed by contributing themes that emerged from the data and which are also presented here.

## Accountability

**Accountability** emerged as an element informing the core category of **engagement**. Feeling ‘accountable’ for the perinatal data of the mothers and babies in their care was verbalised by participants. The element of **accountability** emerged via a number of contributing themes: these were - responsibility for entry of perinatal data, ensuring data accuracy, entering perinatal data for others, and wanting to do the ‘right’ thing. These can be seen in Figure 12.

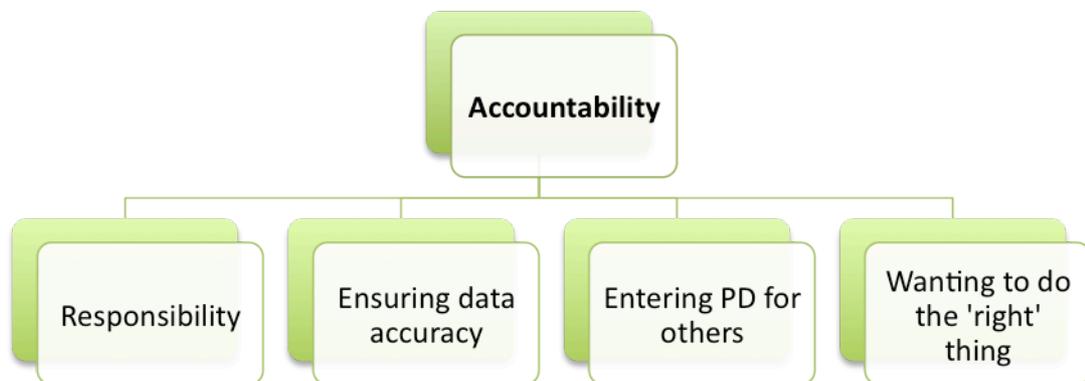


Figure 12: Element - **Accountability**

Each of these contributing themes will now be outlined. The words of the participants will be used to demonstrate how each theme contributes to the higher order element of **accountability**.

## Responsibility



Figure 13: Responsibility

Informing the element of **accountability** is the theme of responsibility. A sense of responsibility for the perinatal data of the mothers and babies in the care of midwives emerged in interviews during discussion of the process of entering perinatal data. A participant exemplifies this in the following statement:

*...and because we are a small unit that has a lot of staff, if we get one of those shifts where everything just goes nuts, you might find that the next day someone will sit down and – well I just do it on mine, because it's my baby. I sit down and go through and check all the perinatal data and just make sure everything is up to date. P2*

Personalising responsibility for the perinatal data entry of women in their care and, at times, the perinatal data for other women they have not directly cared for was verbalised during interviews. Participants believed there was an underlying requirement that the perinatal data entry for women in the care of a particular midwife should be completed by that midwife or passed on at the end of a shift to the next midwife caring for the woman. However, there is no follow up for incomplete perinatal data and midwives do not sign off on completion of the perinatal data, potentially leaving it unclear as to who completed it. At times, perinatal data was found to be incomplete on discharge and there

was no clear recognition of whose job it was to ensure it was done. This lack of follow up reduces how responsibility for the data is experienced. An example of participants expressing this is:

*Because if someone felt they were being directly held responsible for that data input they would ensure and take more care that it was accurate. P13*

*Especially if no one is... can seem to be held accountable for the data input. No one knows. When I've said "Do you know who put the perinatal data in for this lady?"(the response is) "No, No". P13*

*It's hard to work out because everyone's got access to it. You don't really know who's... it doesn't say that "so and so" put this information in and "so and so" put that in. You just wouldn't know. P9*

Should a birth occur close to the change of shift, generally the perinatal data entry will be handed to the midwife coming on. Despite this accepted practice, some participants communicated that they do not readily pass on their perinatal data entry, even if a woman in their care births as their shift is coming to an end. When asked if passing the perinatal data entry on to someone else was something that occurred, this participant responded:

*Oh, sometimes I do but I always sort of make sure I go back and check it as well. 'Cause you know, like the next shift or if I'm doing perinatal data, if it's a name I recognise and know that I didn't do it, then I'll go through and check it to make sure what happened for me, that's what happens on there (the recorded perinatal data). P9*

Another participant communicated that in their unit they leave it for the midwife who was present at the birth. This suggests a unit-wide acceptance of personal responsibility for the perinatal data of the women in each midwife's care.

*And most people here do leave it for the person who was there at the birth too, so unless they are off on a holiday or something and you've asked somebody – could you look at that? I haven't had a chance to do it. So generally we do leave it for the ones who have actually attended the birth. P5*

Participants sometimes exhibited extreme personal responsibility, taking on the responsibility for the entire perinatal data collection for their unit. One participant in particular said:

*The only thing is, it's quite a good point, that currently the quality and integrity of our data is sort of reliant on my personality (laughs) and as I say, if I did leave I don't know what would happen... it'd probably be in a big mess. P11*

This sense of responsibility for perinatal data entry for the women and babies in a specific midwife's care, as well as a concern for the accuracy of the data entered in those records implies accepting **accountability** for that record.

### Ensuring data accuracy

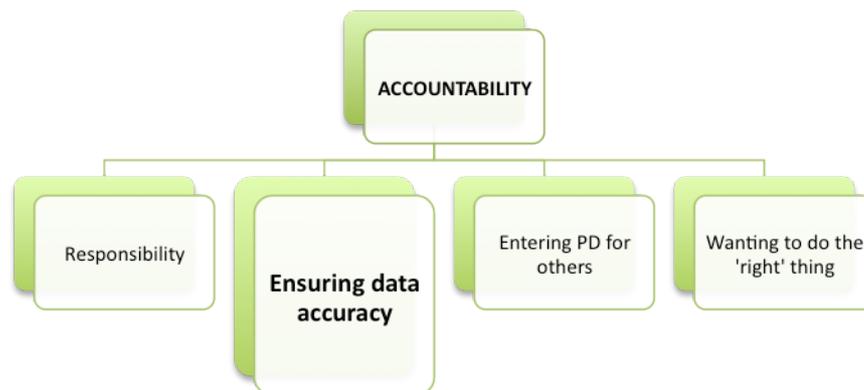


Figure 14: Ensuring data accuracy

The importance reported by participants that perinatal data should be accurate emerged as occurring in different ways in the different maternity units in which participants worked. Despite these nuances it essentially consisted of accurate completion of perinatal data entry or accurate correction of data after return from the Data Collections Unit. Ensuring data accuracy included midwives completing perinatal data entries that belonged to the mothers and babies in their own care as well as making corrections to

perinatal data entries that may have been returned for correction from the perinatal data unit at a later date. This included not only data related to their own direct care, but also data from care undertaken by other midwives who had not completed their entry or data that required correction.

Reports regarding the correcting of errors differed between participants. In a few instances, individuals corrected their own errors – they described how charts were returned to them with sticky notes attached, and how they were responsible for correcting the errors and then returning the completed charts. Following are two examples of this:

*I: Do you have to correct your own (errors)?*

*P3: We have actually started doing that. So there's a pile that has your name on it.*

*Sometimes its things like, for instance the labour and birth component of the data, if the woman's birthed right at the change of shift, the midwife obviously doesn't want to stay back and I've actually followed it up sometimes with people, if it's large amount of data I actually send that back to them to complete. P11*

However, that was not the norm as reported across interviews by different participants. Most participants reported that data accuracy was assured by correcting errors for others. Participant 4 described how she corrected errors to ensure data accuracy as a strategy to avoid awarding blame.

*I: You don't actually give the errors back to the person who made them?*

*P4: No. It's not a blame game.*

The desire to ensure data accuracy emerged consistently throughout participant discussion, and underpins the participants' notion of accountability. This participant goes on to describe that correcting errors for others reduces conflict.

*It's not covering up but sometimes you just correct the errors and, you know. Sometimes, it's not covering up, you just have to breathe through it. I have no answers. I am a nurse... I have no answers for that one. P4*

Further to this, it was reported that in workplaces where midwives were not asked to correct their own errors, there was no understanding that data was returned from the Data Collections Unit for correction.

*...they have no idea that Queensland Health actually send these back whereas people who've come from other facilities who've corrected their own errors, their comment is well "we'd never do that 'cause we'd get it back." So you know that is a big thing. If you have to correct your own mistakes, you don't make them. P9*

This participant communicated that individual midwives were not held accountable for their own perinatal data entries and therefore their own errors. Other participants supported this by reporting that all correction of errors and completion of missing data are done by someone in their unit, usually the perinatal data coordinator. In these cases the accountability for the accuracy and completion of perinatal data is assumed by the coordinator. This role is sometimes voluntary and sometimes assigned. One participant reported in response to the interviewer asking: do you do any cleaning of the data before it goes?:

*I do, yes. Only because it has to be complete for a start. So if it's not done...but I just... my concern was in the past with the paper it was so... with reports there was a 2 to 3 (month) lag time at least on the paper base, and we had no faith in the data from here because we knew it was very inaccurate even with the validation processes. So I actually do review every record now and umm... one to make sure it's complete and two to make sure that it's accurate. P11*

Completing entries and correcting errors for others ensures data accuracy, but the accountability remains difficult to discern. This is perpetuated in the process of entering perinatal data for others.

## Entering perinatal data for others

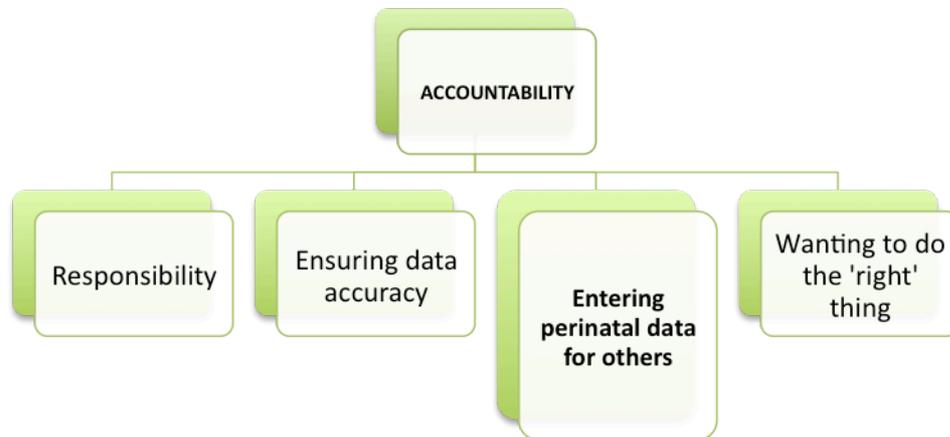


Figure 15: Entering perinatal data for others

Accountability for perinatal data is transferred by the process of entering perinatal data for others. Participants report passing data on to someone else, as well as entering data for casual or agency staff who either do not know the system in use or do not have login access. Entering perinatal data for others was an accepted and common occurrence among participants. A participant communicated;

*Well you really are supposed to make time to do it but if it's really, and sometimes it is just so busy, well then you'd hand it over to someone. And you know, say put a note on it, say that's what needs to be done. P7*

Instances when it is very busy were sometimes dealt with by assigning a staff member to go and enter all the perinatal data.

*In birth suite sometimes if the girls are extremely busy and they don't have time to do it, someone will be allocated to just do the perinatal data's that haven't been finished. P12*

However, some participants also reported the frustration that entering data for others could cause.

*If you don't do it then one of the other colleagues has got to do it, so if that's ever happened to you, then maybe that's a bit of a learning curve not to leave it because you know the buck's got to stop with someone. P4*

In this case, accountability for accurate data is still clearly communicated by participants. However, rather than a personal responsibility by the midwife who was providing direct care for the mother and baby during the events to be entered, it is taken on by whoever has to enter the data. This frustration is described:

*P1: So sometimes the poor discharge midwife will go to do it and there won't be anything entered (laughs) so she has to start from scratch*

*I: And how do you feel about that?*

*P1: People get very annoyed. Yeah I mean, because I've done so many it doesn't take me long. So I think I've just accepted that that's what happens but... yeah.*

When casual or agency staff are working in maternity units and require perinatal data for their mothers and babies to be entered, in most cases the data has to be entered for them by other staff. This is particularly relevant in units that have a HIS where perinatal data is extracted from behind the electronic health record for a mother and baby. Without a password, the midwife has no access to the computer. When casual staff have login access that may have been awarded through another facility, the quality of their perinatal data entry is unknown. Concern regarding this practice is communicated:

*But I think there's a big problem in (place name) and that is that the staff is very transient and we often have a lot of agency midwives at work. They have their own experience with perinatal data so I'm not sure if they're doing it right or perhaps they're the only ones who are doing it right (sighs). P13*

A solution to this issue stated by most participants was password sharing. That is, logging in for midwives who don't have a password using their own login details. Password sharing was reported by all participants. All systems used by participants for perinatal data entry had personal password access either to the perinatal data system

specifically or to the HIS overall. A commonly reported problem was that of participants being locked out of the system for incorrectly entering their password and the existence of a time lag of sometimes days, until that midwife was reinstated with a new password. During these times password sharing was seen as a solution by midwives enabling them to continue the necessary job of entering perinatal data. This means, when an audit of who entered perinatal data for particular instances was undertaken (such as error identification or education and training), login details did not necessarily match those of the actual midwife who entered the data. Some midwives had a clear understanding of this risk, but others did not.

*And so you think you're doing somebody a favour by logging in for them but you know it wouldn't be an accurate account of who had input it. P13*

*I don't like asking the other girls to put their details in because if I enter something in on someone else's password, their name comes up and then... if there was anything that was incorrect, I ...not that I've... if that has ever happened. P12*

*So that can be an issue for some people and you know, the flow on of that is then if they don't enter the data, say in birth suite, the when the woman goes to go home, then that data is not entered, but most staff are really good and will, you know, say "look I'm locked out, can you do this woman's perinatal data because I can't or can you log me in and I could do it" Yeah... which is probably not the right thing to do, be logged in on someone else's but it gets the data in there and so that does happen. P8*

Often when agency or casual staff worked on a unit without password access, they would be logged in by another midwife so they could enter their mother or baby's perinatal data.

Regardless of the implications demonstrated by the above examples, all participants reported either password sharing themselves, or seeing this practice occur in their work units. Password sharing closely relates to the element **software** and its contributing theme system security. This is discussed in further detail later in this chapter on.

## Wanting to do the ‘right’ thing



Figure 16: Wanting to do the ‘right’ thing

Underlying the majority of the discussion in interviews was a general impression that participants wanted to do the ‘right’ thing regarding entering perinatal data. They did not try to make mistakes and there was no malice or obvious intent to do anything other than the ‘right’ thing with perinatal data in their work. One participant summed up this general feeling.

*I: Why wouldn't you make it (the perinatal data) up? Why is it important to you that you put in the right thing?*

*P12: Well it just is. I'm just made that way that I have to do things right. I couldn't just make it up, something that wasn't there. I would rather spend the time to look. I couldn't even think of putting something in that I'd made up. I wouldn't do it. I wouldn't do it.*

This idea resonated with participants who expressed diligence in their work.

*I: And do you find there's some people who are more diligent than others at it (perinatal data)?*

*P2: Oh definitely, yes. It's the same with everything. It's the same people all the time if you looked at it. I just think they are more diligent at what they do. They accept that it's part of their role and it has to be done so they get in and do it.*

Through all the participant interviews, wanting to do the ‘right’ thing was often expressed and contributes to the element of **accountability** via participants trying to do the right thing in their work and with their perinatal data entry.

This discussion presented here of the contributing themes of responsibility, ensuring data accuracy, entering perinatal data for others and wanting to the ‘right’ thing demonstrates relationships between themes, as well as how each theme informs the element of **accountability**. In turn this informs the core category of **engagement**, as participants who hold themselves accountable for the perinatal data entry for women in their care communicated responsibility for ensuring the data accuracy on their entries and a desire to do the ‘right’ thing.

## Valuing

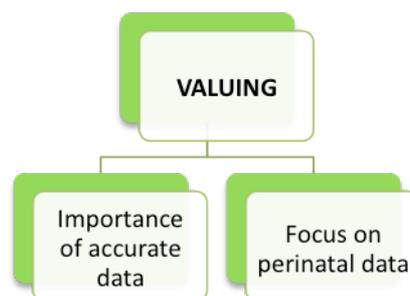


Figure 17: Element - Valuing

The element **valuing** emerged from the data in relation to participants placing a value on perinatal data. Participant 1 referred to it as “*care factor*”. Does the person entering the data care about the data? **Valuing** is an element contributing to the core category **engagement**.

*Because of many years background in (workplace name), I’ve researched and (been part of) funding and building new systems and reporting systems are very important to me, so I see the value in doing it. P15*

**Valuing** perinatal data is informed via the themes of importance of accurate data and focus on perinatal data.

### Importance of accurate data

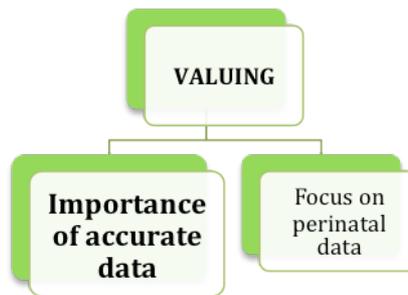


Figure 18: Importance of accurate data

Some participants emphasised the value they placed on the importance of accurate perinatal data. Participants who described perinatal data as something to be valued expressed a need for the data to be accurate. This also included what they identified as the need for accuracy in the paper documentation which was then used to transcribe data into the computer. One participant stated:

*'Cause otherwise how do you get correct information? You know I mean you can probably make statistics say a lot of things and you can make it different to what I can make it and you can read into it. But if you don't have accurate data then you are not ever going to have remotely accurate processes because what comes out is based on what goes in. P3*

This participant exemplifies the importance of accurate data being entered into perinatal data for collection to equating with truthful information in resulting statistics. Another participant also emphasised the importance of accurate data.

*I think it's really important and it's a terrible waste of time if the data's not correct. You know but it's, it's just awful. P1*

Valuing perinatal data, and the belief that accurate perinatal data is important, was communicated by other participants in describing data integrity and hence the meaningfulness of the data that is entered. Participants provide examples:

*Well I just think that the integrity of the data is important... if we are going to collect it, it needs to be meaningful. P11*

*And I think if we're moving towards reacting to this data that we're collecting then it should be meaningful. P13*

Participants described how perinatal data has uses beyond the immediate collection and extraction of data to the Data Collections Unit. An example of their understanding of the wider use of the data was sending the discharge summary to the General Practitioner of the mother and baby. Concern was reported about the potential implications of inaccurate data in such summaries.

*You know at the end of the day you're supposed to print off a perinatal data once its all complete so you can send it to the GP and some of the things you find in there, you say, well you know the information these ladies are getting that they're reading is wrong and what's going back to their GP is wrong. P5*

Concern relating to the importance of data accuracy in such cases as these demonstrates that participants value how inaccurate data could adversely affect the mothers and babies in their care.

One of the other reported uses of perinatal data was assisting the clinical coders within a hospital to assign codes to each client admission. This is undertaken for the purposes of funding. One participant voiced the concern that inaccurate data may lead to inaccurate coding.

*But where it does impact on that is that the coding staff, the people assigning codes and generating DRG's and submitting the coding to Queensland Health, they're looking at the (perinatal data) and gleaning diagnoses and complications and all that sort of stuff from perinatal data. P10*

Assignment of such codes has a direct relationship to funding for the submitting unit and health care institution (Duckett, 1998; Karnon, et al., 2001). Thus, reinforcing the importance of accuracy in perinatal data entered by midwives.

### Focus on perinatal data

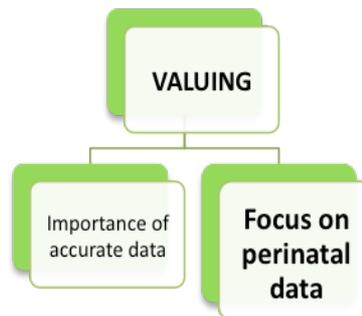


Figure 19: Focus on perinatal data

The need for a focus on perinatal data emerged from interviews, assisting to increase the diligence with which perinatal data entries were completed. Participants verbalised how they focused on perinatal data specifically, indicating the value they placed on accurate perinatal data, hence a relationship between these two contributing themes. They described how they ‘aimed to get it right’. The following statement provides an example of such focus:

*We do have some who are very focused on doing it (perinatal data) like myself, they want to get it correct and they do go back over them before and check that the details are there. So I think that’s admirable. P15*

Another participant thought it may benefit midwives to have been given more information or professional development on the importance of perinatal data. in order to strengthen the focus on perinatal data.

*And maybe, as I say, it's one of the other things I was thinking. Maybe we should get one of the perinatal data (staff) to come or do like a teleconference or something just to try and emphasise the importance of what happens with the data, why it's so important. And maybe clarify a few of the questions that aren't very clear so at least we get consistent data because I'm not sure that...we're collecting accurate data. P13*

Participants communicated how they have the perinatal data “*in the back of their mind*” (P4) when going about the daily care of mothers and babies. This consciousness also demonstrates **valuing** perinatal data as an important part of the care of women. The above discussion outlines how these contributing themes, importance of accurate data and focus on perinatal data relate to each other and together inform the element **valuing**. Valuing the entry of perinatal data into the computer contributes to **engagement** of the participants with perinatal data in ensuring that the data is complete and accurate.

### **Adapting**

The element **adapting** emerged from the data in relation to participants identifying, on multiple occasions, how they had to adapt in order to successfully use their system for perinatal data entry. Examples provided by participants of their adaption strategies included overcoming fear and becoming familiar with the software. The midwives in this research bring to computerised perinatal data entry:- feelings about using computers, experience with other systems (both positive and negative) as well as expectations that affect their mindset. These can be difficult to change. The process of midwives adapting to the software for entering perinatal data contributes to the core category of engagement with perinatal data. One participant summed up how they were required to adapt by saying:

*I think it's just that it's a new process, it's not something that we've grown up with. And you know like most things, people just need time to adapt to them. P8*

The element **adapting** is informed by the themes of: midwives role, familiarity with software over time, using computers, perceived computer literacy, just another job to do and change. This is visually represented in Figure 20.

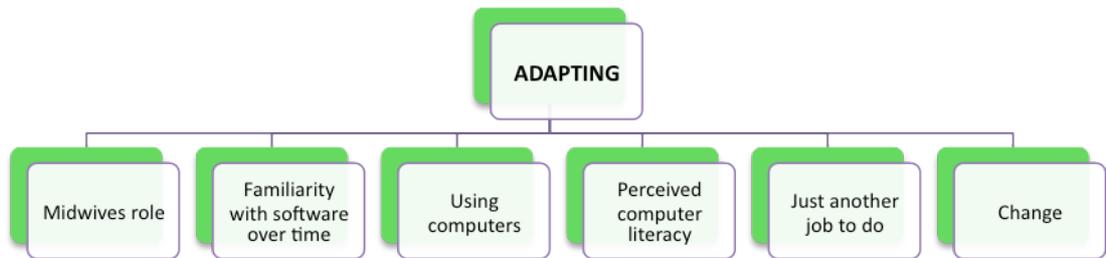


Figure 20: Element - Adapting

These contributing themes and their contribution to the element **adapting** are presented here.

### Midwives role

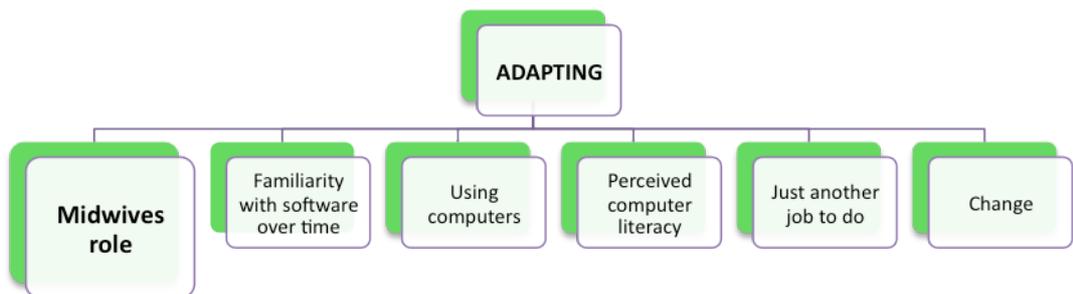


Figure 21: Midwives role

Participants who used a health information system (HIS) in their daily work expressed an acceptance of computerised data entry as part of the midwives role even though they still report writing in the paper medical record.

*P6: I know that when a woman comes in (to antenatal clinic) for her first visit, that's when we, or sometimes it's a phone interview, we get all that information and put it into (the HIS). So we don't do any writing at all, put it all straight into the computer.*

*I: So they don't have a paper medical record anymore?*

*P6: Oh, yes they do. Sorry, that's mostly for demographics. We just don't record their day-to-day observations and all that sort of stuff in there.*

However, most participants said that they do not record directly into a health information system. This finding suggests that midwives core business is focused on the 'hands on care' of mother and baby, and entering perinatal data is seen as a lesser priority.

*And I think for me it's not as high on the list of priorities as getting the baby and mother well looked after. P3*

*They don't necessarily see that technology side of things as part of their nice midwifery role. P13*

Participants articulated how they generally record this same data into the medical record as part of their daily work. This suggests an acceptance as part of the midwives role of the more traditional function of writing in the paper medical record. A view that computerised perinatal data entry is not part of the midwives role was also perceived to be held by others. These 'others' were described by participants as other inpatients and visitors to the ward.

*We often can't do it at the computer or at the desk on the ward when taking a lady around to the ward simply because visitors or other patients think you're not doing anything sitting at a computer. That's not how they see nursing traditionally. So they see our role as totally different. Why is that nurse sitting doing something on a computer? When she should be out here taking care of people? So we have to do it (perinatal data) in a discrete area so you don't look like you are doing nothing sitting in front of the computer. So that's a mindset that needs to change as well. P15*

Interviews revealed that perinatal data entry should be entirely removed from the role of the midwife as it was believed the task took midwives away from the more important job of ‘caring for the mother and baby’. Participants discussed the benefits of a non-clinical person or administrative worker entering perinatal data as an alternative to it being done by the midwife. Some participants expressed the idea that perhaps entering perinatal data was more of a clerical function than a midwife’s function.

I: *You said before that you don’t understand why someone else isn’t doing it who’s an administrative person. Why do you think that?*

P3: *I think it’s just a data entry process that is a benefit to us but I don’t think it needs midwifery.*

I: *So you would still collect all the information on paper and fill out the...*

P3: *Yeah, yeah. I think that’s really important because you have to have an understanding of what’s gone on in the process of the labour and stuff to be actually writing the comments to write in other things but that actual, once that actual documentation, that basic documentation, I don’t see why that can’t be done by a ward clerk or someone.*

This thought was reiterated by other participants.

*There’s this sense that it’s more of a clerical function than anything else. P10*

Although some participants felt very strongly in principle about the idea of administration staff entering perinatal data for midwives, participants viewed that possessing clinical skills was a necessary prerequisite to collecting perinatal data.

*I know that when I am going through and I see something, umm, I am trying to think of an example really, like the baby was in special care nursery for something for three days and you go back and there’s nothing – normal weight, good apgars, nothing in the maternal history in the perinatal data but then you go to the chart, well yes the mother was diabetic or someone forgot to include that. So again I don’t know how well an admin person could interpret that. P11*

Participants expressed consternation about whether all the information that was required to be entered was definitely recorded somewhere; be it in the chart for entry by someone else like another midwife, or by an administrative clerk. Participants described on one hand how the chart is a ‘minefield’, and on the other that the paperwork had changed over time with more check boxes than freehand text. This they thought would aid

administrative perinatal data entry. A few participants who had experiences of different work jurisdictions, had previously encountered administrative staff or retired midwives taking on this role. They had witnessed this in other states of Australia or overseas and thought that this could also be the case in Queensland. Despite this, it was still communicated by the participants in this research that being ‘skilled up’ on midwifery terminology and practice was important.

*I: Do you feel there is a role for an Administrative Officer in entering some information into perinatal data?*

*P5: Yes definitely. But you really want someone who is skilled up, someone who’s trustworthy and responsible that you can give that work to who you feel they will be dedicated and doing it well.*

The perceptions regarding perinatal data entry requiring clinical expertise also relate to the element of **valuing** with participants highlighting dedication, trustworthiness and responsibility to ensure the accuracy of the entered data. This affects engagement with the computer for perinatal data entry by participants. This relationship also demonstrates that midwifery practices are not compartmentalised but all play an important role in contributing to the care of mothers and babies.

### **Familiarity with software over time**

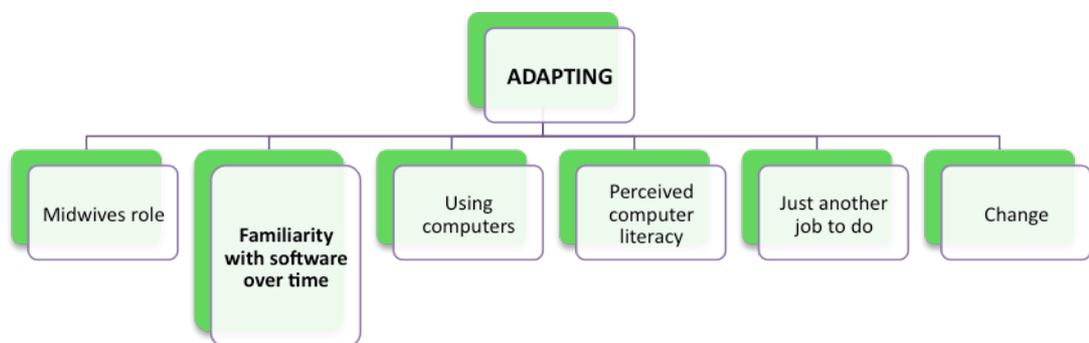


Figure 22: Familiarity with software over time

Participants described how adapting to using various software systems to enter perinatal data occurred as a result of them over time becoming more familiar with the software.

*It takes a little bit of getting used to like anything but once you're used to entering the data, you certainly become a little bit more proficient at it and its easier to go through. P12*

This was supported by participant 2 who emphasised that there has been a number of problems experienced during the introduction of computerised perinatal data entry.

*It's not so bad now. Everyone's cottoned on that you've got to be really careful and I'm not having so many issues but when it first started.. Oh we had a lot of problems. P2*

Participants told how they developed a familiarity with the software over time. This was accomplished by learning abbreviations for the more commonly entered terms, working out software nuances such as saving regularly, and moving from needing a lot of support to being able to do it *blindfolded*. This familiarity involved learning by experience. An example of this was the loss of data which reinforced the need for participants to click 'save' regularly. This familiarity relates to participants feelings about using computers which will now be discussed.

### Using computers

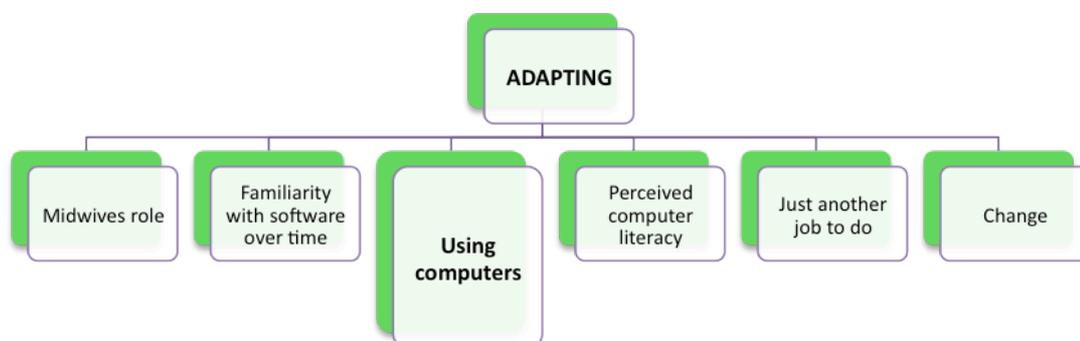


Figure 23: Using computers

Participants communicated a variety of feelings about using computers in general and in particular how this affected their entry of perinatal data. These perceptions ranged from participants stating they were *good with computers, enjoyed using computers* or *liked computers* and therefore didn't mind the computerisation of perinatal data entry through to others who referred to not having grown up with computers, having an aversion to computers and finding it a struggle.

*I remember thinking 'Oh my God this is going to take so long!' That computers are here and we're all using them and that's probably the norm. That's what's going to happen. P1*

One participant expressed fear about the safety and security of the data entered.

*It's a nut behind the wheel. I'm fearful that I probably could delete everything or someone else could come and delete everything. I've said I've done obs (observations) and the obs are not down because I haven't pressed enter. P4*

Participants described the changing face of technology in society and how this is moving into maternity services. Several participants spoke of mothers and their support people using mobile devices in the birth suite, taking and emailing photos within minutes of their baby's birth. It was reported that women were using online applications on these devices to record contractions. Some participants saw this increasingly common use of technology as reflecting the need for midwives to get in touch with society.

*I guess we live in an electronic age and people have to get with the programme basically. P9*

A reflection of other technological changes in broader society was viewed by some participants as beneficial for the environment. Paperless records were seen as being environmentally responsible. These feelings about using computers relate to how participants experience **adapting** to using software for perinatal data entry.

There was much mention of using other software in the various units that participants worked in, and how this contributed to **adapting** to the use of computers to enter perinatal data. In general this involved email, online education packages, pathology results inquiry, client administration software, staff management software, as well as standalone systems developed specifically for in-house use. Examples provided included Excel spreadsheets for local data collection. Participants commented that they use computers all the time at work, in some cases for up to 15 years.

I: *So apart from perinatal data entry, do you use computers at work for anything else?*

P2: *Oh, all the time. Always getting on and off, admission stuff, getting labels and thinks like that.*

Another participant commented similarly:

I: *You've said you've used one program and it's been superseded to another, do you use computers for anything else?*

P3: *Yeah. All the pathology, you've pathology stuff comes through. Education stuff comes through.*

I: *So that's communication, your emails, stuff like that?*

P3: *All your email stuff. There's very little verbal communication. It's all you know linked on that now.*

Using other software, such as the variety outlined above, assisted some participants, to adapt to using computers for perinatal data entry. It also increased their frustration with what they suggested was duplication of data entry across different systems.

*(We use) another computer program with all the same information but umm slightly different. Intrapartum transfers and why they transfer and what interventions that they had. Whether they had a ventouse forceps. Yeah. So similar stuff to what perinatal data is collecting. P5*

Duplication of data and the associated frustration is discussed further as a theme contributing to the element **workload** later in this chapter.

## Perceived computer literacy

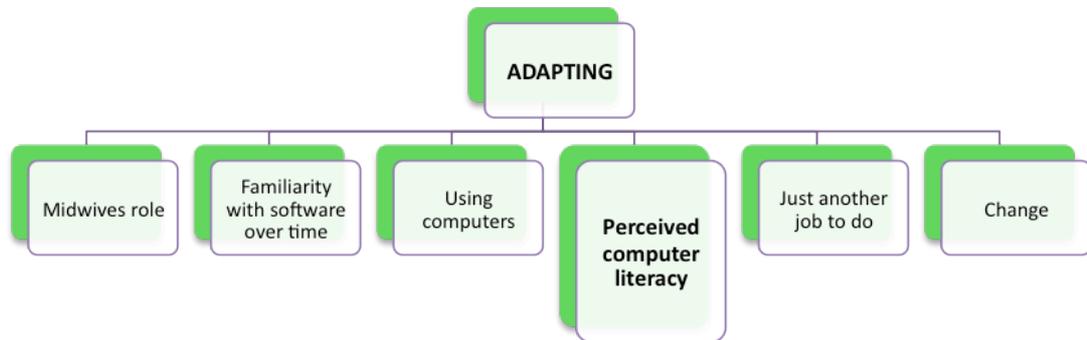


Figure 24: Perceived computer literacy

Participants openly discussed their own computer literacy. This related specifically to the ease and speed of entering perinatal data. Participants who perceived themselves as computer literate communicated adapting to the computerisation of perinatal data entry more readily than those who did not.

*I know I'm not really computer literate. I'm always happy to go and ask other people, to ask them to show me. I'm sure there are people more effective who can enter it (perinatal data) more rapidly and have a you know, put it (perinatal data) in quicker than I do. P3*

Several participants made mention of the aging of the nursing and midwifery workforce and believed this had a negative impact on computer literacy.

*Yes 'cause how old are nurses and midwives? I think the average age is like 48? And it's not, some embrace it and they just wouldn't be without their iPhone, iPad, iPod i-everything. And others who are a bit like me and just find that technology is really so time consuming and intrusive that you so have a bit of a negative side about it. P5*

*Because we're forced to use it, we're forced to learn aren't we? And so it's just like, I was 50. But there are midwives here who are older than that and really not inclined to even want to know about it but they've had to learn. P6*

The aging workforce was seen by participants as having an influence on ability to adapt to computers. New graduates and staff undertaking higher education were perceived as having greater computer literacy.

*I think it will be a little bit different with the girls that come through now because computers are so much more a part of our place of work. So I think that they'll have an easier understanding or they'll just... it's more part of their normal... so I think it's just something that they are more familiar with. And I think that's probably the difference, the familiarity. P3*

Perceptions of computer literacy and ability to use a computer to enter perinatal data contributed to **adapting** and therefore the core category of **engagement**. Adaption grounded in a familiarity with computers, and the software for perinatal data entry combined with perceptions of personal computer literacy, promotes **engagement** with perinatal data entry software.

### **Just another job to do**

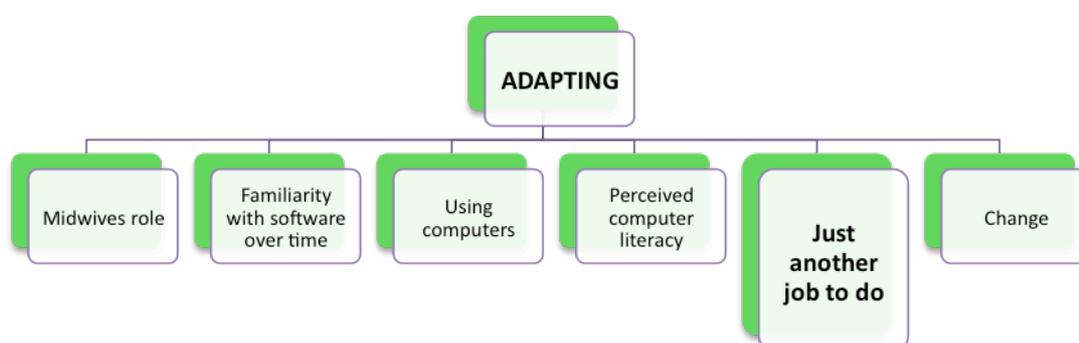


Figure 25: Just another job to do

The data in this theme, just another job to do, describes the notion that, if entering perinatal data into a computer is here to stay, then rather than fight it midwives should just accept it and move forward.

*You have to get used to using it, that's all there is to do. We take the attitude we have no choice. P2*

*You've got to do it and it's just another thing you've for to do in your day. P12*

*So it's just another think we have to do. You know, it's part of wheat we have to do like giving out panadol, we've got to do our perinatal data. P14*

Participants who saw perinatal data entry as ‘just another job to do’ appeared not to value it particularly. They also found difficulty seeing a benefit in completing it. The implication is that for some, there was a resigned acceptance in that it is yet another job that has to be done.

*Definitely there were grizzles at the beginning but most of it’s... you know, you’re just resigned so you just do it. P8*

*It’s just one of those jobs that’s got to be done. P12*

*Because it’s just a task. It’s an annoying task that needs completing. P13*

As already presented under the earlier theme of midwives role, perinatal data entry into the computer is seen by some as just another task that their role encompasses and as such ‘just needs to be done’. This resignation to the task of perinatal data entry helps to adapt to the requirement to get the job done and contributes to engagement with the computer for perinatal data entry either positively or negatively depending on the participant.

## Change

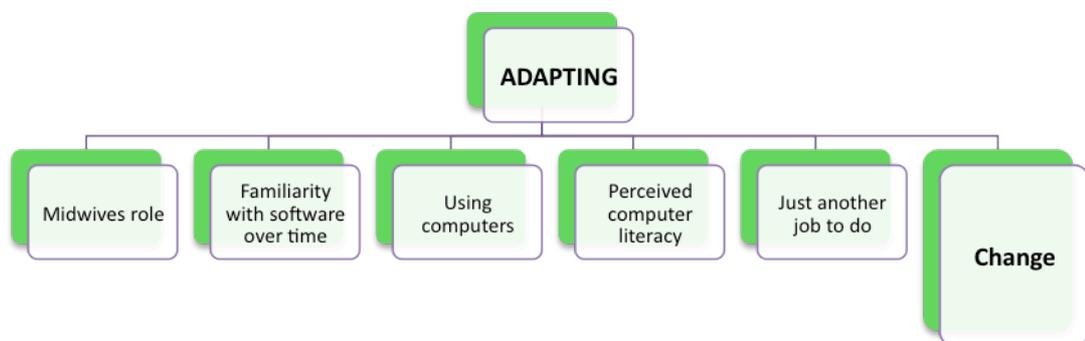


Figure 26: Change

Participants communicated awareness of a resistance to change and adaption to using computerised perinatal data entry within the areas in which they worked. This stemmed from a number of sources including conceptions about the average age of the midwives and the length of time working in one place.

*A large proportion of them (midwives) are in the same boat about anything that involves change. Umm, so sometimes it's just a resistance to change. P11*

*I think nurses aren't good at change and they don't like things new. They have to see how it works first before they actually have a go at it. P4*

Reluctance to change sometimes went as far as specifically resisting entering perinatal data.

*...there's a small core of people in certain areas as well, it's the same people over and over – they just don't do it. They feel it's not their position or they really don't put a lot of value on it I guess. P11*

A resistance to the technological component of perinatal data entry was also expressed.

*...but I think again it's a staffing issue with regard to ummm, let me think of the word... it's a dislike of technology, a fear of it. So you introduce more technology I think it would just cause more fear and reluctance. And probably they're very willing to allow someone else do that task. P13*

*I think it's probably a combination but I see a reluctance to change. They have been shown a certain way and that certain level was acceptable and because it was acceptable then, 'that's the way I was shown how to do it and that's the way I'm going to do it because I know it's correct'. And it might have been at the outset but they're comfortable with, this is how they were taught whether it was correct or not and therefore this is how to do it. P13*

Adapting to the software system for perinatal data entry involves an acceptance of change, which participants said can be threatening. This was particularly so if they perceived the change to be forced on them.

*Change can be a bit threatening and as I said, like new things come along and there is an expectation that we will just do it and that can irritate some people, that expectation. P8*

*Some nurses do their best to avoid it. Especially the older, well one specific midwife says 'why do I have to do this?' and again I have to say it's our duty of care. P4*

*And some of the more mature ones, it's you know some of them will avoid it altogether, doing any computer work. P9*

*I think it's a case of because of ummm, some of the midwives have probably worked here for quite some time so it's just an old school type of thing that could occur in any unit. P13*

These statements suggest a perception that the age of midwives has some relationship to their willingness to change. This in turn relates to an ability to adapt to using software systems for perinatal data entry. Such adaption in turn affects their engagement with the computer for entry of perinatal data.

The discussion of the element **adapting** illustrates how each theme: midwives role, familiarity with software over time, using computers, using other software, perceived computer literacy, just another job to do and change inform this element and relate to each other in contributing to the core category of **engagement**.

### Perceived benefits

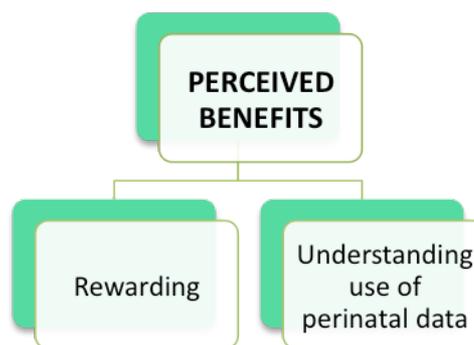


Figure 27: Element - Perceived benefits

Receiving a benefit in exchange for the effort of entering perinatal data was expressed by some participants and contributed to their willingness to take on the task of entering

perinatal data. The benefits communicated by participants inform the element **perceived benefit** and fell within the contributing themes: rewarding, and understanding the use of perinatal data. These will now be presented in more detail.

## Rewarding

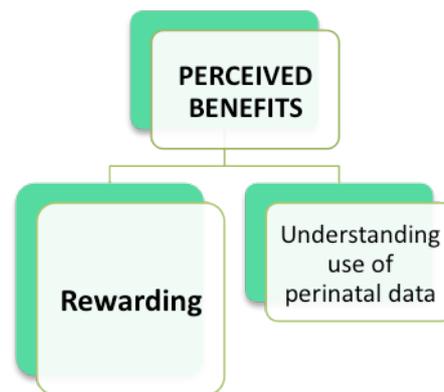


Figure 28: Rewarding

Some participants communicated how they felt rewarded in return for the effort of entering perinatal data. Three examples that emerged from the interviews of ways participants perceived entering perinatal data as rewarding were;

- improvement to written documentation as it is needed for transcription of perinatal data into the computer
- the ability to see what the woman has gone through during her admission as well previous admissions
- that perinatal data could be used as a good auditing tool.

Computerisation of perinatal data also resulted in the ability to access the data in new and very fast ways not existing with the paper form. However, it is the accuracy of the

data that is the linchpin of the quality of the information obtained from the data. This was expressed in the following way.

*And if it's not (accurate) then it just frustrates me that you can't rely on it for reports. The benefit of the online version that we have now, in the past with the paper version we could get no reports back from the perinatal data unit except their generic reports they provide quarterly. Now with the online version I can send them an email and say I'd like to know what percentage of women that birthed in the last six months had a PPH (post partum haemorrhage) or any questions and they can run a report from that electronically for me. P11*

Another more personal reward communicated by participants was that entering perinatal data such enabled them to *sit down after a busy day* and enter the data.

*Sometimes sitting down to do your perinatal data is your reward after a busy day. P4*

*I actually really like it because it gives you the opportunity to sit down (laughs) and we all check our emails at the same time or maybe we read the notices or look at opportunities for jobs available or I do anyway, I usually have a cup of tea at the same time. P6*

Perceiving a reward for the effort of entering perinatal data was communicated by participants as a contribution to their acceptance of completing the task and the value they placed on doing it well. Such perception contributed to engagement of participants with perinatal data entry through getting something in return for the effort of entering the data, and therefore desiring to undertake and complete the process.

## Understanding the use of perinatal data

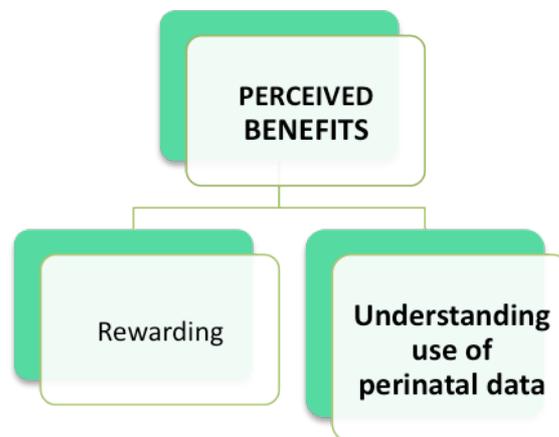


Figure 29: Understanding use of perinatal data

Participants varied in their understanding of the use of perinatal data. This ranged from having very little understanding of how and what the data is used for through to knowledge about being able to utilise the data to retrieve reports and statistics for analysis. Understanding the use of a phenomenon in service increases the potential for its successful use (Caldeira & Ward, 2002). This participant openly expressed that they did not know.

I: *And do you know what the data is used for?*

P12: *I have absolutely no idea.*

I: *Have you, when you think about the data, do you know anything about the data that is collected?*

P12: *What it's used for?*

I: *Yes*

P12: *I'm aware that it's used for other things but I've never looked into exactly what.*

Other participants though, demonstrated a more detailed understanding.

*Well I have an understanding that the data needs to be collected because of looking at outcomes. That it's really important for that scenario of looking at perinatal mortality and morbidity papers and results and stuff. That correlation of looking at what's going on I think is really important. That's both for an understanding of what's happening in midwifery now and obstetrics and what's happened in the past. So looking if there's any benefits gained. P3*

Participants said that even when midwives understood what the data was for, there were occasions when they could not relate that understanding to their clinical practice or to the mothers and babies in their care.

*A lot of people perceive the perinatal data as just stats and don't know that clinically there's anything in it for them. P10*

Discussion was not unified between participants regarding the direct usefulness of perinatal data for themselves or the mothers and babies in their care. Examples of seeing perinatal data as a useful tool centred on information that could be gained with accurate data from the perinatal data collection.

*P1: ...so then I guess that moved over to this system for me, to see well what could it do, what it was capable of, what information we could glean from it that might impact on our practice. You know might be able to help improve our practice.*

*I: And you're probably that person (an information source) now for other people.*

*P1: Yeah, although as I said, because you don't get a lot of time dedicated to actually do anything with the information, I think most people probably just think it's just a job they have to do and don't see that it might be a useful tool.*

*I: Is there anyone (else) who you see who you think actually does see it as a useful tool and that values the information...?*

*P1: Umm...negative.*

Another participant communicated that the data entered can contribute to a woman's future birth options and therefore incorrect data could negatively alter those choices.

*Because sometimes in the documentation there are things stated that actually aren't demonstrated. For example, reasons for CS (caesarean section). You might have very normal CTG's (cardiotocographic monitoring) and all that sort of thing. So it does make you double check and double check and follow it up with your line managers and all that sort of thing because when you are putting in perinatal data, it pretty much sets the woman's future choices. So CPD (cephalopelvic disproportion) pretty much doesn't give them any options for VBAC (vaginal birth after caesarean) you know? So I find the perinatal data really important for the women. P5*

Participants who viewed data as a useful tool, communicated that, without accurate perinatal data, statistics provided for reports both locally and state-wide would be of

less use, and they expressed frustration at not being able to then rely on those statistics for reports.

*I think any sort of research, any sort of data can get us from what we do to say what we do and get more assistance to do it or whatever the argument might be. We have to have the concrete data to show. P15*

A further example of the perceived usefulness of perinatal data can be seen in the process of calculating statistics as part of an education program directly benefiting the women and babies in the care of midwives. However, others found perinatal data was not powerful enough, or was not collecting enough or the right information to be really useful.

*It doesn't truly reflect I think. When I get the reports and see what happened, it doesn't feel like it's, giving it enough power. It's not there. So we might not have resussed (resuscitated) them in the first 5 minutes but at 10 minutes they started grunting and we have to special them in our nursery, you know? P14*

This participant is communicating that a newborn's apgars are recorded at one, five and 10 minutes in the perinatal data, so any interventions done after this time are not reflected through this data unless the baby is then admitted to the special care nursery (SCN). Therefore, the time and expertise required to intervene in this instance is not captured by perinatal data. This knowledge of what accurate perinatal data can achieve suggests participants can see the usefulness of perinatal data as well areas where it may be improved. This could be seen as similar to using perinatal data as an auditing tool as described above in the theme rewarding.

Participants expressed some concern that the data was framed too much by the medical model and argued that if it was more focused on midwifery, midwives might see it as more useful for themselves as well as the mothers and babies in their care.

*I think it's just that, well epidural, nitrous oxide, you know like it's sort of an expectation (that you fill in those fields). And then "Other" (pause) that's midwifery core business whereas the other's medical and I guess it is more a medical piece of documentation... I do feel it's more aimed at the medical model. P5*

Participants seem less than satisfied with the range of objective biological indicators inherent within perinatal data. Consequently, they were challenged in fulfilling their role by assigning values to some fields within perinatal data. The perceived medical nature of the collection detracts from midwives seeing the data as a useful tool. Such detraction directly affects engagement with perinatal data entry.

Statements offered above by participants around the themes rewarding and understanding of the use of perinatal data contribute to informing the element of **perceived benefits**. They suggest that participants who have an understanding, see the data as useful and find some form of reward perceive benefits from perinatal data. This, in turn, contributes to their engagement therefore informing the core category of **engagement**.

## Workload

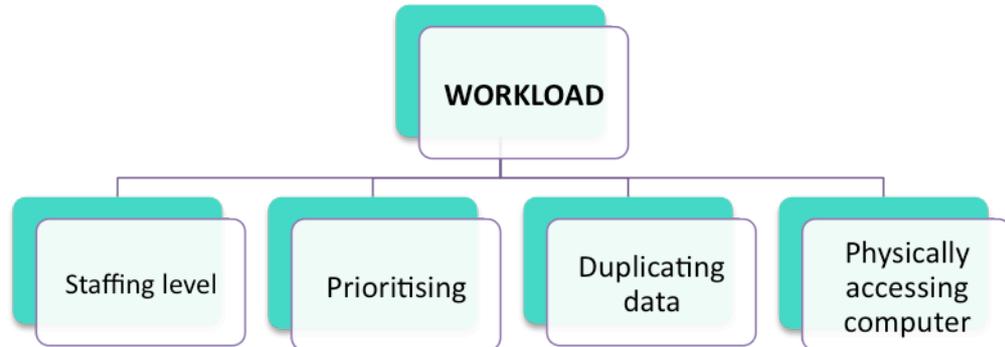


Figure 30: Element - Workload

**Workload** emerged as an element informing engagement and is directly informed by the themes staffing level, prioritising, duplicating data, and physically accessing a computer. The most common response by participants to the research question of ‘What influences you in the process of collecting and entering perinatal data?’ related to the amount of time it takes, and being able to find this time in an already busy day.

*Because often birth suite's like mad and trying to enter all that data right from the start can sometime(s) be a little difficult and there's a bit of a backlog sometimes. P12*

Participants described midwifery work as being busy, with no time for perinatal data entry. These busy times can be followed by times of not being so time pressured. This was when opportunities presented themselves to sit down and enter perinatal data. Within what was described as an extremely demanding workload, some participants identified that they did find the time for perinatal data entry, whether on the same shift or on another day. Others however, could not find the time, either passing on their data entry to others, or knowingly leaving it incomplete. The perception of how much time it

takes to enter perinatal data differed between participants. Despite this, they were generally in agreement that it takes longer to enter perinatal data into the computer than it took to fill out the old paper form. Each of the contributing themes to the element **workload** had an influence on a participant finding the time.

## Staffing level

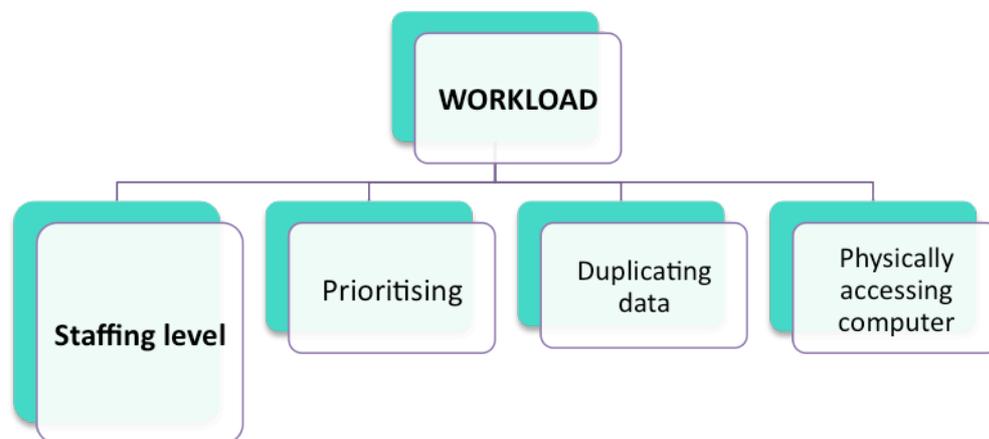


Figure 31: Staffing level

Participants consistently reported not having enough staff to do all the jobs which they say are increasingly given to midwives. This also included perinatal data entry.

*There isn't and unfortunately there's lots of change happening in healthcare as you would know and we don't get any extra staff to do any of these things. There is an expectation that 'Oh here's a new programme or whatever, it has to be done.' Unfortunately it isn't factored in, no. P8*

This sentiment was also expressed by many other participants:

*And that's another job we seem to as a midwife we seem to be lobbed more jobs and more jobs. And they are happy to take more midwives off us but they are not happy to, they add more jobs but won't give us more staff. P4*

*We've been overloaded with extra stuff recently, it's getting a bit beyond a joke I think. Not a specific thing but others as well. We're not getting allocated extra time and people are getting sick of it. P2*

*If we've all got three discharges each, it's a little bit difficult to get it all done. P6*

*When there's a lull in our workload, that's the time when you'd expect to catch up on these things but historically it would appear that when there's a lull in maternity physical workload, there's no acknowledgement of the tasks that need to be done and so staff are removed to assist in other areas. P13*

Staffing levels affected the number of women who midwives were required to look after. In turn, this affected their capacity to enter perinatal data.

*... and put it in as you're going and that depends on your workload. That will impact on it. If you're one on one with an induction of labour then sure you've got time to actually be putting that (perinatal data) in. But if you've got an induction plus 4, 5 or 6 women on the ward, that will impact on your time, on whether you can do that. P3*

Participants unanimously described how staffing levels impacted on the time they had to enter perinatal data into the computer, how more time was something they required, and that data entry needed to be factored into their workload. This also relates to how they prioritised their workload during their shift. This is the next contributing theme to be discussed.

## Prioritising

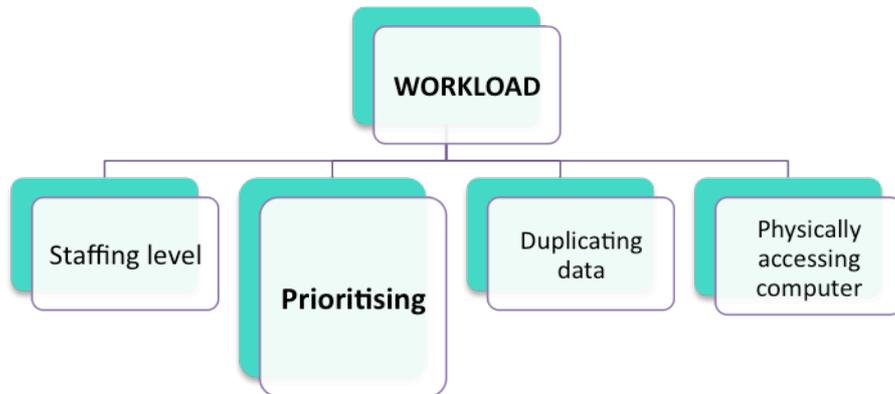


Figure 32: Prioritising

As previously mentioned, midwives report that their daily work can transition from times of what they describe as a manageable workload, to one which is excessively busy. This was particularly if a number of women present to the unit labouring at once. Prioritising this work is required to ensure mothers and babies are well cared for in the time available and entering perinatal data is seen as additional to this. Participants communicated the fact that perinatal data was not high on their priority list and that when pushed for time, they placed priority on the paper chart.

*I'm trying to do the perinatal data quickly so I can get back to what I was doing. It's a priority but it's not... it's down the chain. P14*

Prioritising of time was considered by the participants as a constant concern; one that is required to ensure that the perinatal data entry for mothers and babies in their care is done.

Historically, midwives have entered all data into the woman's medical record, a paper chart storing all information for an admission to hospital. Introduction of computers has

changed the way information is gathered and recorded by midwives. In most work environments referred to by the participants, the paper record continues to be the primary source of information for the mother and baby. As indicated above, at times midwives place priority on the paper medical record above entering data into a HIS or perinatal data.

*A lot of people don't give the same importance to the electronic version as they do to the paper version. So that's one of the problems there. From that data point of view, it still doesn't seem to hit home that it's just as important as the paper. P10*

As part of the data entry process, placing priority on the paper chart ensures the data is at least recorded somewhere for later transcription into perinatal data. This is done either by the attending midwife or by another midwife to whom the job is passed. Participants talked about there not being enough importance placed on the written documentation although this still had priority over entering perinatal data into the computer.

*And so I was quite surprised how little documentation took place and it's being addressed. So you see if there is insufficient documentation especially if there was a litigation, it would be horrendous. Then if there is not enough importance on the written information then the electronic stuff is just absolutely second if not third. P13*

Priority to complete the paper chart pushes perinatal data entry into the computer down the list of jobs that the midwives had to attend to during their shift, thereby affecting engagement with the process of perinatal data entry.

## Duplicating data

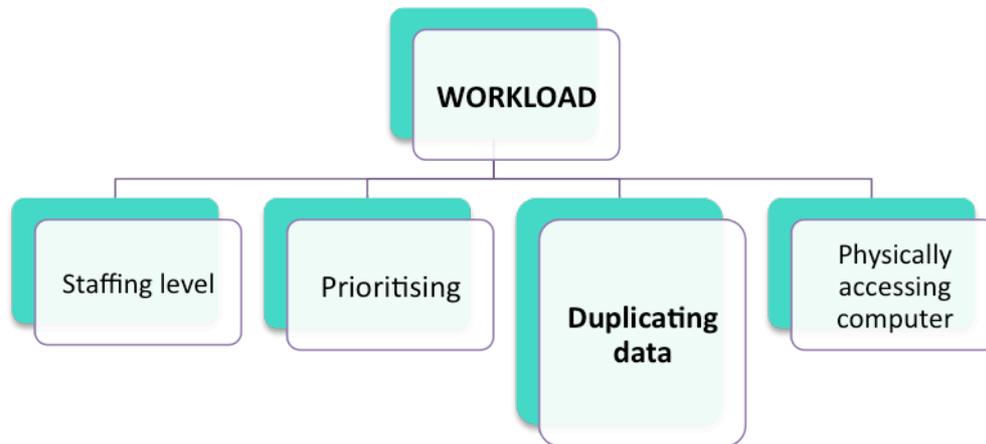


Figure 33: Duplicating data

Participants communicated their frustration that the data entered for perinatal data collection was also entered on paper. They described how this occurred often, in many different places and sometimes into several other computer software systems as well. This duplication of data was reported as repetitive and a waste of precious time. Some participants wondered why this data could not simply be entered once and used where it was required.

*P5: It's a shame, a lot of the information seems to be very similar. It would be great to have it all punched in and then zipped off too...*

*I: Where it needed to go?*

*P5: ... Electronic discharge, zipped off to (programme name), zipped off to perinatal data, you know? It'd be great to be able to because it really is a lot of duplication.*

In addition to the organisational requirements for data entry into several systems, participants reported that some units collected statistics on their own births, thereby duplicating perinatal data entry into their own internally developed spreadsheets. An example was given by the following participant:

P1: *I just keep specs on the types of births, like I have done from (de-identified facility). I've got a spreadsheet.*

I: *And is that data from the information system or hand collected data you aggregate yourself?*

P1: *Hand data. Just like SVB, water births, forceps.*

I: *Straight out of the birth register?*

P1: *Yes because I have to count that every month anyway.*

Other participants also reported duplication of the data that is collected into these locally developed databases. In addition to localised collections, other mandatory computer software was in use, including systems with data entry related to discharge and mandatory hearing tests. Participants reported that some of this information is recorded within perinatal data but also required separate entry into other software systems. This was a cause of immense frustration.

*And you know that's one of my biggest beefs is that I can't understand why that electronic discharge summary can't be done somehow, I know it's probably easier said than done but linked to the perinatal data. And that's a lot of the people's complaints too is that we're doing double work, putting all this information in and then we've got to put it all in again. But I mean that would be a massive thing to get done I know that. P7*

Despite the frustration it caused, multiple handling of data, both written and electronic, seemed to be accepted as a given; something that has to happen even though participants clearly would prefer another way. This recognition of duplication of data entry affects engagement with perinatal data because participants are frustrated with multiple entry of the same data which increases the time spent in front of a computer and contributes to frustration with the process.

## Physically accessing a computer

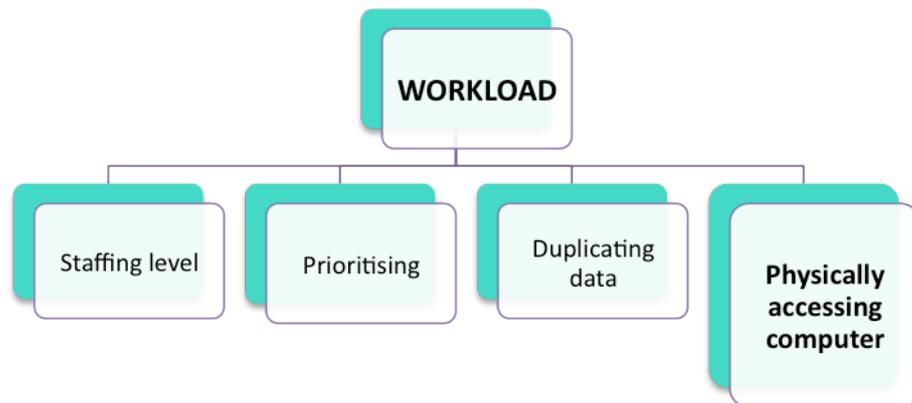


Figure 34: Physically accessing computer

To enter perinatal data a midwife requires access to a computer. With time already a precious commodity, all participants communicated difficulty in getting access, at the point of care, to a computer, or later when they had specifically made time to enter perinatal data. This issue was mainly reported during the daytime hours when competition between midwives, administrative, medical and allied health staff who all requiring access to computers for their own needs, was at peak demand. After hours, this competition was considered less of an issue. However, the more common, regular requirement for perinatal data entry for antenatal bookings and discharges occurred during these daytime hours.

*It's not a quick database to get into and that's if the computer is still free, if the doctor's not booking someone for an emergency section or something or looking up pathology or what have you. P8*

*And sometimes, especially in the morning when the doctors come on, they want to look at results and there's other people doing other bits on the computer. That can be a bit frustrating if you can't get to a computer. P12*

*We've got two computers for our ward. One's manned for office hours by the AO (Administrative Officer) so have one computer left to look up lab results, look up scans, admit the baby, discharge someone, record workload and enter perinatal data. P14*

Some participants described how a group access login to the computer was utilised so that each user then only had to login to the perinatal data component. This was used to combat the identified issue of increased time to login when access to computers is limited. This participant suggests that an increase in available computers is required.

*I guess if you're in a corporate office in Brisbane, it might seem a good idea to roll some of these programmes out and I do think this one is a good one but there is that inherent problem of access to computers for any of these new programmes and so maybe when new programmes are rolled out, computers should come with them. Resources should come with them because like units, individual units, don't have any extra money to buy these computers and it's difficult. P8*

Regarding the physical location of computers, most participants reported that a computer was located just outside the birth suite with another one on the maternity unit. This meant that the midwife could be near a labouring or newly birthed woman when entering the largest component of perinatal data into the computer. Even with computers located in close proximity to where the midwife is working, without immediate access to them, midwives ability to enter perinatal data is decreased, thus impacting on their workload. Impeded access to a computer to enter perinatal data directly affects engagement by participants, forcing them to find other opportunities at later time to fulfil this mandatory part of their role. In such cases passing on perinatal data entry may be the outcome, resulting in data being entered by someone other than the midwife who was caring for a particular woman. Consequently more time is taken and there is an increased possibility of being less complete and accurate as discussed under the element **Accountability** and theme entering perinatal data for others.

The element **workload** is informed by the themes staffing level, prioritising, duplicating data, and physically accessing a computer. The above discussion of these themes using participant quotes demonstrates how the element **workload** informs the core category of **engagement** and how engagement with software for perinatal data entry being pushed down the chain of priorities, by events over which the midwife has little control.

### Shifting Focus

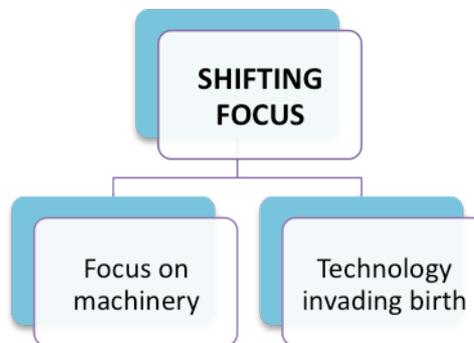


Figure 35: Element – Shifting focus

Midwifery was perceived by all participants as a caring profession with its focus specifically on the mother and baby. Due to the nature of computerised perinatal data entry, participants communicated that at times this caused a physical shifting of focus. The shift was from the care of the mother and baby to the machinery; the computer. The element **shifting focus** is informed by the themes of focus on machinery and technology invading birth, both of which are now presented here.

## Focus on machinery

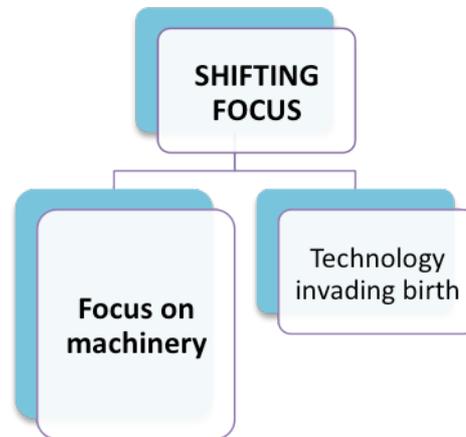


Figure 36: Focus on machinery

Participants described having to change their focus from the mother to the computer, and deal with it as a separate entity while entering perinatal data. This was perceived to detract from the therapeutic relationship and move the focus onto the computer.

*...but there's also a lack of eye contact, a lack of you know, some women don't feel like you're really... like even when you say at a normal antenatal visit "I'm sorry but I have to do some writing so you know I'm listening to you." So for me to input onto the computer at that time would not be right. P3*

This perceived lack of attention to the mother and baby while caring for them resonated further with participants who communicated wanting to focus on the mother and not the computer.

*I guess 'cause when I'm in the room, I'm there with the woman not with the computer. I don't want to get caught up doing that in front of them. Like they come out to where we actually do it and they can see that you're working but I think when they're in the room and you're in the room looking after them, then you're there for them and not the computer stuff. P9*

For some, knowing that the data had to be entered into the computer at some stage was a distraction from care of the woman. Participants felt that it placed the focus onto the computer. It was felt that some women would accept it while others might wonder what the midwife was doing.

*I think it would be really horrible in some ways, like that it becomes all very technical. You lose, you know, with birth especially, it's such an emotional, you know, spiritual event as well as physical, so making it all more technical sort of puts focus on machinery and things. P1*

Some participants went as far to say that this was another example of technology invading birth, as expressed in the following theme.

### **Technology invading birth**

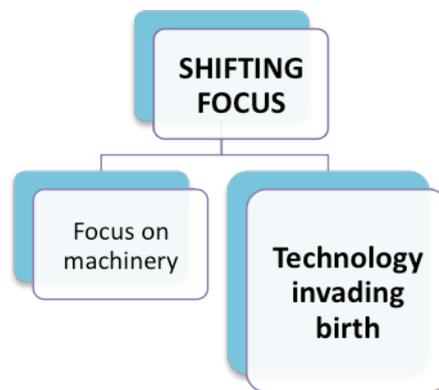


Figure 37: Technology invading birth

Participants were divided over whether computers in the birth suite or at the bedside in each mother's room were appropriate. There was some suggestion that this was the way things were going with a move towards paperless hospitals.

*Eventually the plan is to go all electronic records anyway. It will need to be in there. P11*

Other participants felt computers in the birth suite were inappropriate.

*But to actually move it (computer) into birth suite I think would be for me intrusive, it's bringing technology into a place where technology doesn't belong. You know yourself the difference that even the monitors that we have, now we have to have the monitors. How much difference, it just changes the ambiance. And we're talking about the woman being in a primal state with not many distractions around, the Cardiotocograph (CTG) and it's exactly that. You're checking that it's recording, you're checking that you're getting an accurate heart rate (rather than focusing on the woman). P3*

*But ... we're talking low risk and trying to reduce the technology in a labour room. P12*

Participants talked about machinery that is already in a birth suite distracting from the hands-on care of the labouring mother. They described how a computer would add to this distraction. Other participants could see a computer as possibly an intrusion but were optimistic that it could be integrated without that occurring.

*I think it would depend on how you used it. Like you would obviously say to the mother that 'this is a computer database that we put your information in during the course of me looking after you. I will be popping in some bits and pieces' and you would just explain what I am doing and I would hope that it wouldn't intrude because it would just be a piece of equipment in the corner. P8*

The element **shifting focus** discussed here, is informed by the themes of focus on machinery and technology invading birth. Shifting focus from the woman to the computer was not seen by participants as an optimal situation, and appears to be something that could lead to a delay in the recording of perinatal data. Together these themes inform the core category of **engagement** via midwives experiencing use of computers for perinatal data as negatively affecting their attention to the mothers and babies in their care. There exist relationships between this element and the elements of **Adapting** and **Valuing**. Participants who value perinatal data entry

## Software

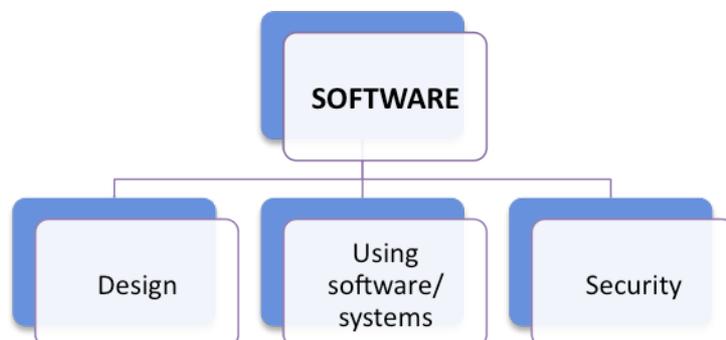


Figure 38: Element - Software

In the process of entering perinatal data several versions of software were used both currently and historically by participants. Difficulty using the software had a large impact on participants and this in turn affected their engagement with it. In particular, those participants who had used multiple systems voiced opinions about how easy or difficult the software was to use. Participants spoke extensively about challenges with the software. Although all participants had issues with software for perinatal data entry into a computer, some spoke about this from the perspective of how to overcome them. The themes of design, using software/systems and security together informed this element, **software**.

## Design

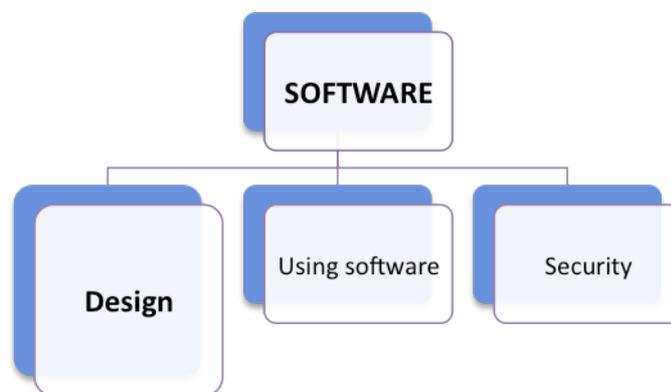


Figure 39: Design

Participants believed that midwife users of perinatal data software should be involved in the design of such software. No participants reported providing any feedback on the design of any system for perinatal data entry.

*Perhaps that when people are just developing systems that they really need to consult with clinicians and the data, the people entering the data. P1*

One of the most concerning design issues appeared to be related to field definitions. Participants felt that the questions were ambiguous and that had midwives been involved in the development, this may have been avoided.

*I: You said before that sometimes the questions (on perinatal data) seem a bit ambiguous. Do you find that with a lot of the questions or do you feel they're just straightforward?*

*P2: The way it reads to me is that it hasn't been written by a clinician. I don't know whether that's true or not or it hasn't been complied by clinicians because some of it doesn't seem to make sense.*

With several software systems in use by participants for perinatal data entry, specific data about clinician involvement in the development was not readily available. However, follow-up discussion with the Data Collections Unit of Queensland Health, in Brisbane, Queensland, revealed that the initial design of the online perinatal data form used in some Queensland Health facilities was internal. Since the rollout, various updates to the online form have been made as a result of suggestions from midwives (Pers comm. Ms Colleen Morris 21/5/12).

Participants complained that there is no match between the paper medical record and the fields collected for perinatal data thus inhibiting clear transfer of that data into the computer.

*The paper and electronic versions are different to each other so they're out of sequence. P1*

This was seen as a difficulty when someone other than the birthing midwife attempted to successfully enter perinatal data from the chart.

As some participants had experienced more than one system for perinatal data entry, there was expression that the newer systems were an improvement on the old. However,

peculiar responses from the software that do not make sense clinically were reported across participants.

P3: *And some of the things that come back are quite bizarre. They are not accurate questions or they're not appropriate.*

I: *Clinically appropriate? Or for what the programme collects?*

P3: *What they're looking at. What the error comes back as. Like it might be... if someone's had an IUFD (intrauterine foetal death) and they want to know - was the baby for discharge, or sometimes - how it is breast feeding on discharge or - has it had vitamin K.*

These perceived failings in the design of the perinatal data software frustrated participants and again reinforced the notion that midwives value accurate data and expect the software they use to be logical and to function similarly to other clinical processes. In turn, this frustration affected their engagement with perinatal data software.

### Using software

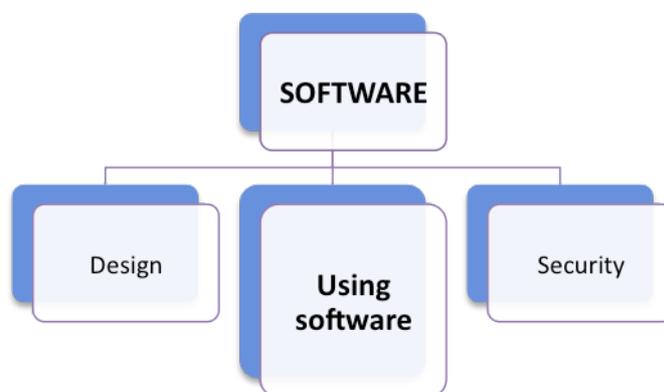


Figure 40: Using software systems

Challenges with using software for perinatal data entry were reported with great emotion and frustration by the participants. This was summed up by a participant who said with heightened feeling towards the end of the interview: *Is it going to get any*

better? P2. Overall, participants expressed difficulty using the variety of software systems, but some spoke about ways of overcoming such challenges. It was stated that entering data onto the computer was not as easy as writing on the paper form. Many issues contributed to this, such as finding time, locating the appropriate responses in drop down boxes and time lag moving between screens.

*I think you touched on the one thing that really, I find, you know, is the most difficult part for perinatal data is that it is a slow database to work your way through and the fact that it reboots all the time when you enter data. That wastes an incredible amount of time. P5*

Some of the software used to enter perinatal data is Internet based. This slows down the functionality somewhat compared with systems operating in-house either via an intranet or part of a HIS. When midwives are busy, this time consuming, sluggish functionality was reported as very frustrating.

*I mean I find the system very tedious, very frustrating simply because it keeps going away and saving things. You've got to sometimes out it in again. It doesn't work as fast as what we do. So it's quite tedious that way. P15*

Entering data into drop down boxes can open up other selections of data, which form trees of information. If a mother or baby has more complicated issues during admission such as hypertension, diabetes or an admission to SCN, the midwife needs to enter data into several levels of these data trees. This increases the amount of data stored in the perinatal data record and was reported as slowing down the operation of the programme.

*If you had someone that might be pre(mature), a diabetic... she has labour complications, the baby goes to SCN and you spend all that time with all those trees, it doubles the amount of time you spend doing it. P2*

Participants report entering data and then waiting for long periods while the computer software operates before finally being able to move on and enter further data. It was thought that sometimes this related to the particular computer hardware being used, or

to the number of users logged in and accessing the system simultaneously. Some participants were concerned about computer downtime or system down time and subsequent maintenance and they reported having experienced this. During such times, the ability to enter perinatal data was unavailable.

After the data had been entered, the act of saving the data was also reported as highly problematic. Some software systems were reported to have no automatic save function. This meant that the midwife who forgets to save information between screens or before moving onto another task must re-enter this unsaved data and lost data.

*Yeah well sometimes it does freeze, you know and sometimes it doesn't save properly. When you put it all in and then you go to save it and it stuffs up, that's really, really frustrating. P7*

Participants communicated being frustrated by having to regularly change their passwords, or being locked out for entering their password incorrectly and saw this as a negative function of perinatal data software systems. As already discussed under the element **accountability**, once locked out it could take days to be unlocked during which time perinatal data cannot be entered unless another midwife shares their password.

*And you only get a couple of goes and sometimes for some reason it's just incredibly difficult just to get it to accept passwords. I think it's probably that we get them wrong but it's, I don't know. Sometimes it will work and then sometimes it won't. You've just got to be really careful. P2*

A further issue that participants said was frustrating was computer time-outs with accompanied lost data. The following participant quote describes this:

*P12: But the thing I've noticed, if you get called off to do something and you forget to save it, the data's gone when you come back because the computer shuts down within minutes. And you've lost all that and then you've got to go back and re-enter it. You learn quick(ly) to make sure you save the data as you go along.*

*I: And why does the computer shut down so quickly do you think?*

*P12: I'm not sure. I asked that question, well I've been saying at work recently that it's very annoying when it's just...it doesn't actually shut down. You've just timed out.*

Participants varied in their understanding of this time-out function and how it might relate to system security but all identified time-outs as a source of frustration. Both these issues are further discussed in the next theme, security.

## Security

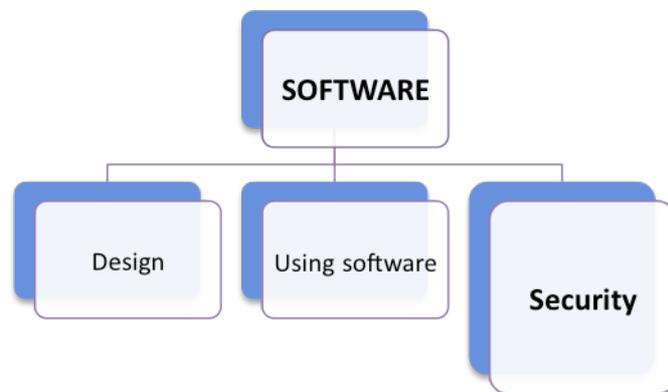


Figure 41: Security

Participants had different levels of understanding about the security requirements of systems used to enter perinatal data. As some systems were Internet based and others operating via an Intranet, different levels of security were in place.

*I understand that the information's confidential but so is everything else we do in our job. I don't understand why it has to be like bloomin Fort Knox to get into the thing. P2*

Participants communicated that they did not understand the reasons behind password sensitivity and why regular changing of the password for perinatal data software was required. Some participants described other software systems for which their password had not required changing in many years.

P4: *It's not forgiving of lockouts. I mean two attempts and you're gone. That's not forgiving. I mean how many passwords have we all got in our brains? We have to have a spreadsheet for them. And it's not forgiving as such. And I don't think it should be changed every three months. I mean why can't it be like our email address or (other software)? It all stays the same.*

I: *And how do you think that would be in terms of security?*

P4: *Why would you want to look at someone's delivery? Who would want to find out about that? Who wants to find that out?*

The lack of understanding of differing security requirements resonated across participants.

P5: *There's all the safety aspects around that sort of technology too. People having their personal details, not so much when you talk about perinatal data but just for security, how secure are these things, identity fraud.*

I: *Why do you say that's probably not specific around perinatal data?*

P5: *Well I s'pose people could get into it couldn't they? I'm just assuming why would somebody want to download medical (pause) well I s'pose they could.*

I: *That's interesting. Do you feel the system seems to you to be secure?*

P5: *Until you said that I though yes!*

Conversely, other participants felt the security of the current system was lacking.

*I think it is reasonably secure in that it does close down if you walk away from it, it will close down but from our point of view, like the geography of our unit, it's not secure because our computers are on the birth suite corridor where people come and go, like visitors come and go and also out in our postnatal/antenatal unit, the computers aren't... they actually face into the corridor and I guess if someone wanted to surreptitiously look as they walk past, they could see information.*

P8

Participants' awareness of the information security requirements for perinatal data entered into the computer was limited. This lack of awareness affects engagement with perinatal data by increasing user annoyance that the system is not operating in the same way other systems in use by the participants' function. These difficulties around security for perinatal data directly affect their engagement with entry of such data. Frustration with software that does not function as expected, combined with a lack of input in the design of such software, influences engagement with perinatal data.

The element **software** presented above is informed by the themes of design, using software/systems and security. Discussion of these themes and demonstration of their connectedness show how together they support **software** emerging from the data as an element of the core category of **engagement**.

## Knowledge

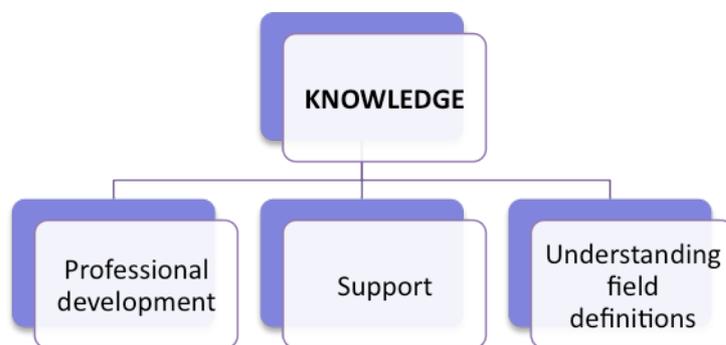


Figure 42: Knowledge

**Engagement** with perinatal data was informed by the element **knowledge**, which was subsequently informed via the themes of professional development, support, and understanding field definitions. Participants reported that learning a new system for perinatal data entry was a challenge. The following is an example:

*Each person sort of warms to different things and I kind of liked it. I found it a little bit of a challenge to have to do that. P1*

Data in relation to each of the contributing themes will now be presented.

## Professional development

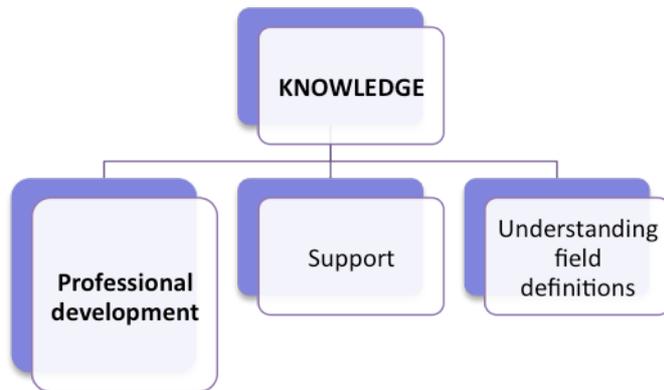


Figure 43: Professional development

All participants described how, prior to implementation, they participated in differing levels of formal professional development on perinatal data entry software; variation in both hours of training given and depth of information. However, if they commenced work after the system had been implemented in the facility, limited or no formal professional development was available.

*It was someone from (place name) that trained us and we could access them quite easily for a while, a few months but then after that, yeah, I really wouldn't know who, I guess it would be IT department. P7*

The professional development that some participants received ranged from short one or two-hour sessions to the provision of a practice system where users could enter dummy data to practise before systems went live.

*Well as I said the training was quite perfunctory simply because we had two people doing a frantic, you know, visit of all the different places in Queensland and I think it was an hour they were in our area. P15*

Some participants reported that they were on different shifts or on leave and missed such professional development altogether.

*They did have training but I wasn't around when that training was done. I was on holidays so I didn't get any training. P3*

This participant also reported learning the two software systems she had used for perinatal data entry ‘on the job’. Her learning was supplemented by approaching other midwives and the perinatal data coordinator to answer questions as they arose. Another participant reported being called away due to the nature of her job as a midwife and missing some of the professional development.

*I: What sort of training did you get for this system?*

*P2: Oh bits and pieces. I missed the first training session in the morning. I came on in the afternoon and I think I got called away halfway through the session to attend an emergency and I just picked it up as I went along. I’ve rung up a few times cause I couldn’t do things and cause I just sit and fiddle with it. You learn as you go along.*

There appeared to be no consistency for professional development of staff within institutions, or even in similar systems implemented in different institutions. New midwives who started in an area after implementation of a system for perinatal data entry were either trained by an educator, a perinatal data coordinator or by just learning ‘on the job’. The inconsistency in training points to an inconsistency in midwives knowledge of the software in use. An example of this was participants describing how when an item was not visible on the screen, it would simply be left blank, even if simply scrolling down a drop down box revealed the appropriate category. Some simply were not aware of the drop down boxes. This limited professional development and resultant lack of knowledge of the software in use led to necessary information not being recorded.

## Support

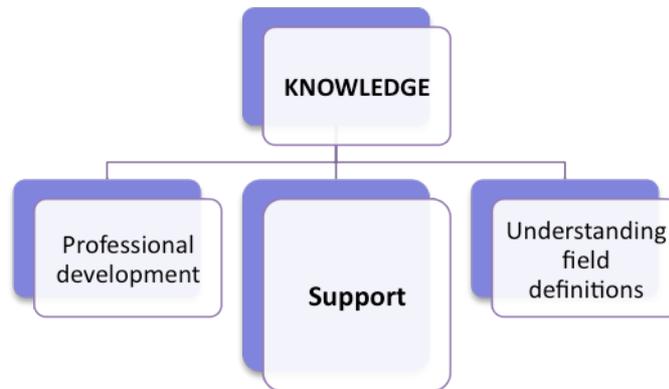


Figure 44: Support

When software systems are implemented into healthcare, there is a requirement for technical support to facilitate successful use (Kirkley, 2004; Rahimi, Moberg, Timpka & Vimarlund, 2008). Needs for support for perinatal data entry ranged between computer support, software support, and unlocking passwords to field definition clarification. Participants in this research perceived a lack of technical support for the systems used to enter perinatal data, both at the implementation stage and in ongoing use.

*I didn't feel like we got a lot of support at the beginning. P2*

Although some participants reported having access to telephone technical support, they indicated that this support did not involve the perinatal data software itself.

*There is on the front screen (an 1800 number) but that's for computer difficulties. But quite often when you ring up, they don't really know the perinatal data. P7*

Participants reported having a dedicated person to provide support specifically for perinatal data; this could be either a trainer or educator. Participants found these people very useful although access to them was only available on that person's rostered shifts. However, in some instances this resource was cut back until it no longer existed.

*And like even when the system was implemented at our place, there was support for a period of time and then that person had their hours cut in half and then finally gone. So then it just... then the only support there is now is the help desk (for the health information system, not perinatal data specifically). P1*

Where support was available it was considered helpful by participants. This was often only during office hours (nine am to five pm) rather than over the 24 hours that midwives work and during times when babies are born. One participant reported having no access to training manuals once the system was online.

*When we had the paper system, there used to be a book, it was like an instruction manual. I was actually thinking about that the other day. There doesn't seem to be any instruction manual with this thing, like a hard copy. I used to refer people to that folder. I had it in general view where people could access it if they wanted to but I don't think, I'm not aware that there's anything available for the computer bit. P2*

After further discussion it became clear that it was the knowledge of how to access an electronic version that was the issue, and when given that knowledge the online manual was located.

### Understanding field definitions

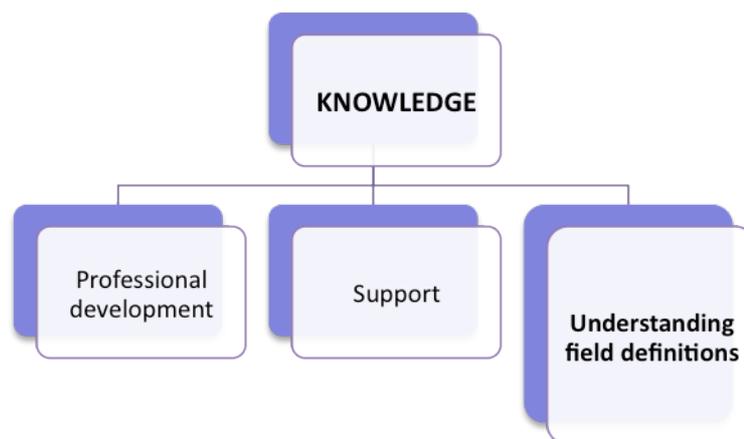


Figure 45: Understanding field definitions

Participants reported no consistent understanding of field definitions. Those who had received training conveyed that it did not include understanding the requirements for each field definition. This resulted in different assumptions about the correct data to enter for each field. Participant 13 communicated getting, prior to receiving formal training, different and vague responses from other midwives to questions about field definitions.

*Prior ... I was just inputting data and asking questions about what does this mean and what does this mean? And being given quite different vague kind of responses. P13*

This participant went on to express concerns about some of the fields inconsistently understood by midwives including herself.

*I'm not sure all the staff really appreciate what some of the questions are. For example, is the same midwife giving you the care antenatally as at the delivery? And most of the midwives will put yes. And I'm not sure that's correct because we are not doing midwifery led care. P13*

Other participants also indicated both confusion and lack of training on what data is required for each perinatal data field.

*In particular, I found it related to the outcome of previous pregnancies. And people got confused when there were twin pregnancies with two different outcomes. ... I haven't come across any training on it. P15*

The inconsistency in responses between midwives within units left some midwives unsure of what the correct data to be entered actually is. Such inconsistencies stem from a lack of knowledge by individuals regarding perinatal data fields as a result of poor training and less than adequate support. This in turn affects the engagement of participants with perinatal data, when not knowing the correct response may affect timely perinatal data entry on the mothers and babies in the care of midwives or of others.

The above discussion and presentation of participant voices show how the element **knowledge** informs the core category of engagement via the themes professional development, support, and understanding field definitions. The final element and its contributing themes is **data entry**. This will now be discussed.

### Data entry

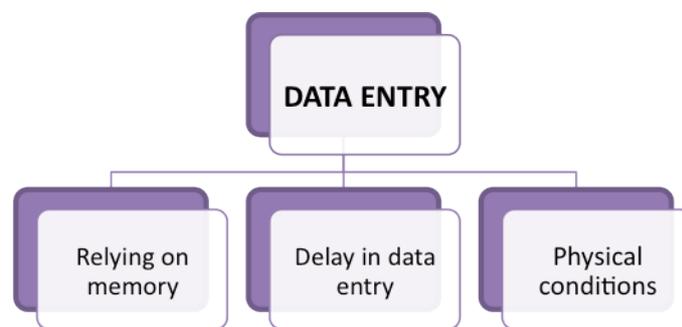


Figure 46: Element - Data entry

Almost all participants discussed issues and challenges with the actual process of entering perinatal data. They also spoke of disadvantages of the computerised approach now that the paper perinatal data record has been superseded by computer data entry. Without computers in the birth suite or in mothers' rooms, point of care data entry, as was achieved on the paper form, cannot be undertaken during the care of the mother and baby. The element **data entry** is informed by the themes of relying on memory, delay in data entry, and physical conditions. These will now be described in detail.

## Relying on memory

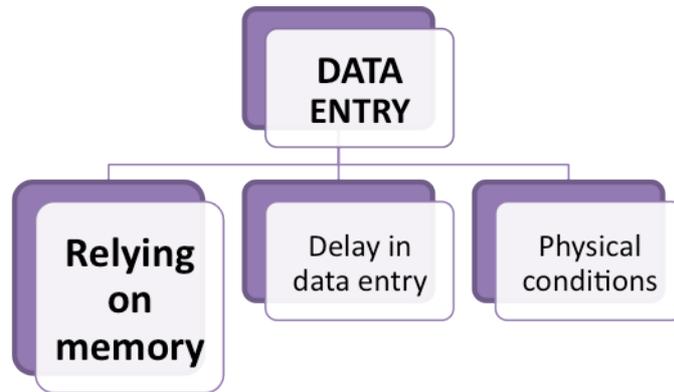


Figure 47: Relying on memory

Midwives entering perinatal data into the computer, rely on their memory to enter some data, rather than look up and transcribe data they have already recorded in the mother's paper medical record. This is described as happening most commonly in the birth suite after a mother has birthed and the midwife caring for her enters the data into the computer.

*Well I wouldn't use the partogram because I know the person, so I know, I'd say if it wasn't, it's usually I've looked after her so I know what all the answers are. P7*

*I have it next to me if it's been my, if I've been with the woman from the start to the end, if I know it all, I might not need to actually look at the chart. P1*

Relying on memory to enter data for women in their care was communicated by participants in direct comparison to entering data for a woman they have not cared for. In this instance, they are required to look up the data in the paper medical record and transcribe it.

*Rather than even at the end of the shift if I've got time I'll go through and sort it because I know I can get through it a bit quicker and because I know all the information, I'm not going... 'cause I know when I've done it for other people, you've got to get the chart and go through it and work out what's actually happened and put it all in. Whereas if you've done the delivery and looked after the lady you know exactly what's happened. P9*

This part of the data entry process is done to save time with the belief that the data that is recalled by the midwife is the same as what they have already recorded at point of care on paper in the medical record.

### Delay in data entry

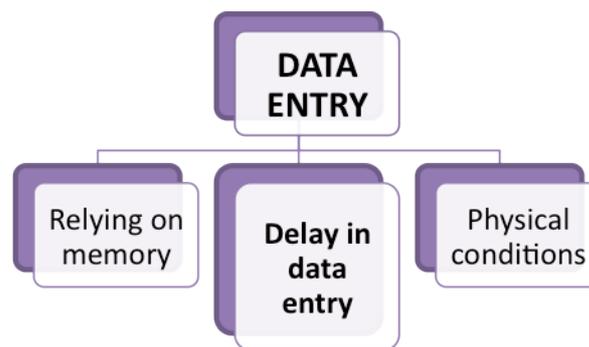


Figure 48: Delay in data entry

Participants reported that there is often a delay in recording perinatal data into the computer. This can range from short, only minutes, to long, such as days.

*Usually a delay, some time period of delay in the recording of the information. It could be minutes, could be hours, could be next shift or it could even be coming back the next day or asking someone else to document it for you. P1*

Delay in data entry can lead to information being lost. An example given by a participant is that if a woman is on the postnatal ward and has some bleeding recorded as postpartum haemorrhage (PPH), this is not entered into perinatal data at the point of care. This is because data is not usually entered again until the woman is discharged. If the discharge midwife was not the one who was caring for the woman at the time of the PPH, it will not be captured in the computer for perinatal data, even though it may be recorded in the care plan or daily midwife's entry of the written record.

P1: *So yes, no we don't go back, you don't go back and put in that there was a PPH perhaps because yes, sort of...*

I: *...and that might not be captured?*

P1: *Be gone, finished. I mean in an ideal world it would be nice to think that it would be, you'd be recording your whole day as it happened, yes and if you could do it then and there but you know in reality, you've just attended to that woman who's bleeding or vomiting and then the emergency buzzer goes and you run out of the room to the next thing with that information in your head ready to be written down later.*

Participants described how a handheld computer or a computer at every point of care for contemporaneous documentation may solve these issues as it could be treated the same as paper.

P2: *at the end you take all your bits and pieces to get your labour length and all that stuff back to the computer.*

I: *So you would never record as you go?*

P2: *Can't! There's no (pause) unless we had an iPad or something you could carry. That was the beauty of the paper system. Because it's just lifting a chart and you could, I've done it before, have a lady who didn't want me to leave and you just sit in the corner and so your bits and pieces.*

It follows that while handheld direct entry hardware is unavailable, there is a priority on the mother's written medical record, as has been previously discussed as a category informing **time** and the element **workload**.

### Physical conditions

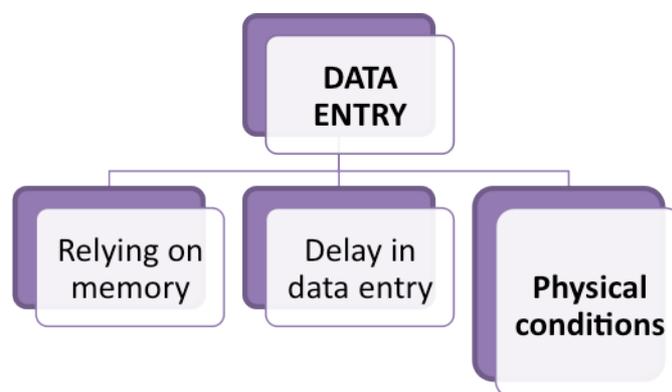


Figure 49: Physical conditions

Birthing presents a high risk of body fluid exposure to birth attendants (Argentero, et al., 2007) and as a consequence, to any equipment they use. Participants communicated that the physical conditions of birth did not make it easy to enter data into a computer due to having, for example, wet hands or wearing gloves.

*I: In terms of being in the birth suite for example and caring for a women, when you say you record on paper and electronically as you go, you're talking about using a partogram?*

*P1: Yeah. So most of us try to and I certainly do try to. It's not always possible because you're using your hands for other things, they're wet, you've got gloves on and then, you know, suddenly you've got to pick up a pen and write on paper.*

Participants described how, even if there was a computer in the room or a hand held device for data entry, they felt they would be very hard to use in the messy conditions of birth. This was particularly so during the second stage of labour when recording foetal heart rates between each contraction is required. A participant questioned how a computer of any sort could be taken into a bathroom. The physical conditions related to the entry of perinatal data contributed to the delay in recording information and the priority placed on the paper medical record which can itself get a bit messy.

*P7: No, you wouldn't touch the computer in second stage.*

*I: Yeah so you'd still use the paper recording for foetal hearts and stuff?*

*P7: Yeah, I think you'd be shot if you did that while she was pushing!*

*I: Yes (laughs) it might get covered in icky stuff*

*P7: It would! Because my paper gets bad enough! And look you could always come back later and do it you know.*

The physical conditions of the birthing environment were seen as not conducive to using computer equipment within the birth suite where the main part of perinatal data is generated. For this reason, the difficulty in accessing a computer directly affects midwives engagement with the software for perinatal data entry because of a delay in the data entered. Therefore, reliance on memory, or a delay to the end of the shift and

passing the data entry onto someone else occurred. As has already been discussed under the element **Accountability** and theme entering perinatal data for others, data entered by someone other than the birthing midwife takes more time and is more difficult. This could possibly lead to less data being entered on that event.

The final element presented here, namely **data entry**, is informed by the themes of relying on memory, delay in data entry, and physical conditions. Together these themes describe the process around physical perinatal data entry by midwives and how **data entry** relates to the core category **engagement**.

## **Summary**

This chapter has presented the findings from this research focusing on the voices of the participants, and in doing so has grounded the findings in the data. Firstly, perinatal data entry into a computer was described to assist the reader in their understanding of the process. Then, constant comparative analysis, a process faithful to Grounded Theory methods, revealed the core category of **engagement** that was described. The discussion included how each of the nine elements of **accountability, valuing, adapting, perceived benefits, knowledge, shifting focus, software, workload and data entry** informed engagement.

The research found that overall midwives have a desire to enter accurate perinatal data, and in essence think they are doing just that. However, the nine elements described in

this chapter as informing **engagement**, are noted as influencing midwives in either enhancing, or forming barriers to, entering perinatal data into a computer.

The next chapter will discuss how these findings are situated within the literature, explaining how beneficial engagement may lead to more complete and accurate perinatal data entry. This will bring to light the realisation of the benefits such accurate data entry can bring to the mothers and babies in the care of midwives. It will also highlight the importance of the data for the short and long-term health records.

## CHAPTER 5 – DISCUSSION

Chapter 4 presented the findings of this Grounded Theory study which examined the factors that influence midwives interaction with the computer when collecting and entering perinatal data. These findings emerged from the data and were presented with a specific focus on the voices of the participants. Positioning participant narratives at the fore ensures grounding in the data. **The Theory of Beneficial Engagement** was introduced along with the core category **engagement**, the nine contributing **elements** and the themes that informed each element.

As explained in Chapter 3, the impetus for this research arose from the researcher's experience of perceived discrepancies between data that was captured on paper perinatal data forms and notes in the medical record. Experiences gained when training and observing midwives use of an obstetric database also served as a catalyst to question what was occurring. The findings of this study revealed many reasons that explain such discrepancies, and are identified in the nine elements that emerged from the data. These nine elements then contributed to the core category of **engagement** and resulted in **The Theory of Beneficial Engagement**. The research question: 'What are the influences on registered nurses and midwives during the process of collecting and entering perinatal data?' was answered through the inductive and systematised data analysis process utilised in this research revealing the elements and contributing themes. This process was fully explicated in Chapter 3 – Research Design.

Building on the findings chapter, the aim of this chapter is to explain the findings in the light of existing literature and how they integrate to elucidate **The Theory of Beneficial Engagement**. As a result of this process, the unique contribution of this research to knowledge and the literature will be demonstrated.

The manner in which this chapter is structured firstly discusses the core category of **engagement** in the broader literature and, importantly for the purposes of this research, its meaning in this study. Then **The Theory of Beneficial Engagement** is described in more detail elucidating links to existing theoretical models. Following this, each of the nine elements will be discussed, closely following the structure of the findings chapter, to comprehensively portray each building block of **The Theory of Beneficial Engagement**. As discussed earlier in Chapter 2, the literature relating to midwives use of ICT is scant and often mixed within the literature regarding general nurses. For this reason, such literature will necessarily be drawn upon at times to explain the findings, keeping in mind that midwifery is both similar and different to nursing.

### **Defining engagement in the literature**

Engagement is a term that is used within academic literature in many different sectors, and as a result has a variety of definitions contextual to each specific area. Within ICT specifically, Davis and Wiedenbeck (2001) credit Hutchins, Hollan and Norman, (1985) with introducing the concept of engagement to the computer domain. This introduction was an effort to explain the adoptive or motivational effects of the interaction style of the user. As ICT utilisation spread in the 1990s, use of the term ‘engagement’ became

more popular, with Laurel (1993, p. 112) stating that “Engagement is considered a desirable – even essential – human response to computer-mediated activities”.

The field of Human Computer Interaction (HCI) has moved on from usability, the matching of systems more closely to user requirements, as the main driver of research, toward the need to understand designs for engaging users of ICT (O'Brien & Toms, 2008). Qualitative research undertaken by O'Brien and Toms (2008), utilising semi-structured interviews with 17 participants, found that the process of engagement was characterised by attributes pertaining to the user of the system and user-system interaction. They defined engagement as

quality of user experience characterised by attributes of challenge, positive effect, durability, aesthetic and sensory appeal, attention, feedback, variety/novelty, interactivity and perceived user control. (O'Brien & Toms, 2008, p. 938)

Their research appraised voluntary use systems finding that successful technologies are not just usable, but also engage their users. This human side of engagement has been conceptualised as “involvement” (Turner, 2012, p. 1). Furthermore, Peters, Castellana and de Freitas, (2009, p. 1) define engagement as a sense of “being occupied with”, implying a more sustained involvement with ICT. Involvement and being occupied with ICT systems for a specific task such as entry of perinatal data, requires complimentary acceptance, understanding and effective use. As a cohort of employees who utilise a mandatory use system for this process, midwives engage in different ways. Rock and Tang (2009) assert that engagement is an attribute that an employee has to offer and cannot be demanded or required by an organisation as part of employment. “The level of engagement of an individual can impact performance in tangible ways” (Rock &

Tang, 2009, p. 7). For midwives entering perinatal data, this relates to the accuracy and completeness of the data they are required to enter for the mothers and babies in their care. It is important to be reminded here that midwives have no choice. Their engagement is required by an organisation as part of their employment.

Engagement can also be defined as a positive, fulfilling work-related state of mind characterised by vigour, dedication and absorption (Bakker, 2009). Research by Bakker (2009), found engaged workers were not super people, do feel tired after a day's work, and are not addicted to their work but find working fun. They are more willing to go the extra mile. Therefore, creating engaged workers should be achievable amongst midwifery staff without demanding any special qualities. Within healthcare, Cresswell, Morrison, Crowe, Robertson and Sheikh (2011, p. 192) define engagement as a “form of involvement which will lead to informed implementation of an effective system that is assimilated into working practices due to close alignment with user needs and expectations”. These authors suggest that within healthcare failure of ICT to realise its full potential is due to the lack of effective approaches to user engagement. In the ICT literature, engagement tends to be defined as a process of involvement with design, implementation and adoption in order to increase the sense of ownership (Carroll, 1997), and reduce resistance to new systems: all themes emerging from this research.

Given that engagement is necessary to increase user input, Chimbo, Gelderblom and de Villiers (2011) define a new principle for HCI. They called this principle ‘engagability’, meaning the extent to which the software application can fully engage the user by providing a complete and satisfying user experience. In most studies relating to

engagement, attention and emotional involvement are identified as being fundamental (Peters, et al., 2009). Applying this research finding to engagement with perinatal data systems refers to a user's state, motivation, goal or tendency towards being invested in, or concerned with, the system and the data entry required. Therefore, engagement with ICT is something personal that an employee has to offer and is essential for humans interacting with computers. Adopting system use and being involved with ICT occurs when users are engaging with ICT; therefore the system is aligning with the user needs and expectations. Such engagement motivates the user to interact in a way that they find positive and fulfilling.

In the context of work, engagement is defined by Maslach and Leiter (1997) as energy, involvement and effectiveness. Reports from their survey research with 322 nurses found that, when nurse leaders or managers develop organisational structures that empower nurses, they create an environment where greater work engagement occurs (Greco, Spence Laschinger & Wong, 2006). These findings build on prior survey research by Maslach and Leiter (1997) that reported when nursing staff found work meaningful, it allowed them to provide quality care, and led to professional development and therefore a stronger involvement and greater effectiveness as their job (Maslach & Leiter, 1997).

### **The core category - Engagement defined for this research**

In this research, it is acknowledged that the term engagement has many dimensions. There are also many fields within ICT where the term is used, and it can be seen that

utilisation of engagement can occur for both mandatory and voluntary use systems. It is important to stress that this research did not set out to measure or assess the level of engagement of individual participants. Engagement therefore, for the purposes of this research, is defined as ‘embracing perinatal data entry into the computer as part of the midwives professional role through understanding the function, benefit and value of timely, accurate perinatal data entry for midwifery practice’. Engaged midwives, will choose to be involved with the system, adopting its use to fulfil their needs to provide appropriate client care based on a resulting alignment with their understanding of the benefits that successful use can offer. The indicators that emerged from the data of this research, of a midwife who is engaging with perinatal data entry are exemplified in part via participant communication regarding the activities of;

- entering perinatal data in a timely manner
- valuing the accuracy of the data individually entered
- understanding the use of perinatal data and seeing the benefit for midwifery practice
- accepting responsibility for the perinatal data of mothers and babies in their care
- following up on those entries to ensure the data in them is an accurate representation of what happened and is recorded elsewhere
- overcoming existing barriers to perinatal data entry
- general communication of a positive attitude to perinatal data entry and desire for others to share this optimism.

‘Engagement’ in this research, relates to both the computer and perinatal data as separate but closely related entities. Therefore the engaged midwife also adapts to

successful use of the system provided for perinatal data entry by ensuring adequate knowledge of the software and the nuances of the field definitions required for accurate perinatal data entry. Engagement with both perinatal data and also the computer system for its entry, engenders a positive and significant addition to the role of the midwife in the process of caring for mothers and babies. In this way, engaged participants most importantly perceive a benefit for their effort in perinatal data entry.

Remembering that collection of perinatal data is mandated at a federal level, it is important to note that engagement within a mandatory use environment differs greatly from engaging users in a voluntary use system (Sørebø & Eikebrokk, 2008). The goals for each are different. For voluntary use the goals are about enhancing the user's desire to want to continue using the system or to come back and use it again (Chimbo, et al., 2011). Enhancing such desire within voluntary use systems could lead to increased engagement. That however, is not the focus of this research. For a mandatory use system, given that the user 'must', or is forced to, use the system, it needs to do what they want, when they want, therefore fulfilling a requirement of successful use. To put this into a simple, modern analogy, the reader might think of any computer game such as Angry Birds developed by Rovio Entertainment Ltd. Users of this gaming software choose to do so voluntarily, hence the game designers want the interface to be as engaging as possible so the user will not get bored and move onto another game thereby reducing earnings. Engaging with such a game is about getting users to desire to continue to use the interface and return to it as often as possible and this is achieved through design and other features enticing engagement. Such strategies for engagement, when successful, are considered so powerful that researchers in the education sector are

harnessing it for creating more engaging training and learning (Prensky, 2007). Compare this with mandatory use systems, such as those experienced by midwives for perinatal data entry. The findings of this research suggest these systems are not engaging but that participants: find them difficult to use, are not supported when problems arise, are not supplied with adequate time and hardware available for use, are lacking in training, had no contribution to their design, and that their use takes them away from what they perceive as their primary role. In midwifery, this is considered to be the care of the mother and baby. However, as already alluded to, some participants appeared to overcome these barriers. Engagement of such participants with the entry of data utilising mandatory-use perinatal data software contributes to **The Theory of Beneficial Engagement**, which will now be discussed in further detail.

### **The Theory of Beneficial Engagement**

In adhering to the use of a Grounded Theory methodology, development of a substantive theory grounded in the data was achieved with this research. Glaser (1978, p. 144) emphasises that theories can be substantive, "...theory developed for a substantive or empirical area of enquiry..." or formal "...theory developed for formal or conceptual area of inquiry". Substantive theory fits the real world, works in predictions and explanations, is relevant to the people concerned, and is readily modifiable. In contrast, formal theory moves beyond one substantive area of research to incorporate comparison with others (Urquhart, et al., 2010). A substantive theory acts as more of a springboard to formal theory (Glaser, 1978, p. 146). Within the literature it is proposed that research requires the development of models that focus on the human side of

interaction with ICT therefore providing valuable and practical information to underpin the design of successful ICT systems (Hollan, et al., 2000; Sharafi, Hedman & Montgomery, 2006; While & Dewsbury, 2011). The research undertaken for this thesis provides new knowledge in the development of such a substantive theory; **The Theory of Beneficial Engagement**. What follows is an elucidation of this substantive theory.

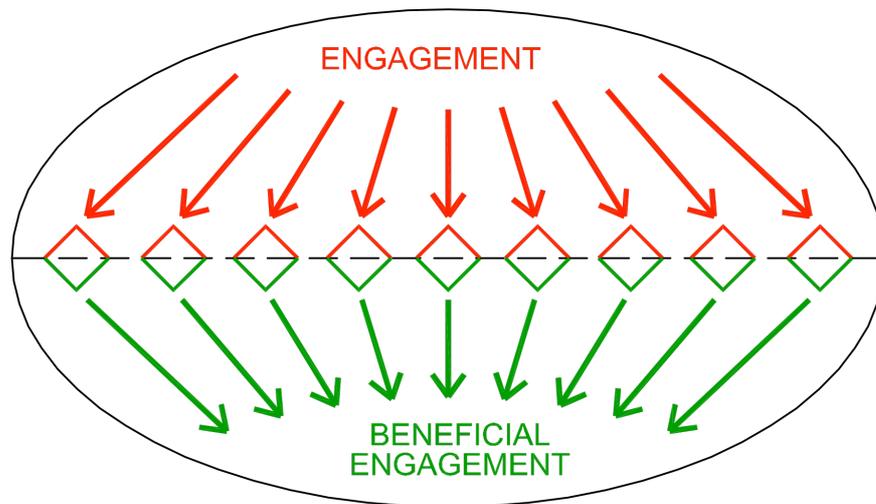


Figure 50: Theory of Beneficial Engagement

As a reminder for the reader **The Theory of Beneficial Engagement** is visually represented above in Figure 51. The central nine diamonds indicate the elements identified in this research as contributing to the core category of ‘engagement’. The theory proposes that as each element is optimised for the user, the arrows proceed from engagement to beneficial engagement. This suggests that with modification of the elements the midwife user may develop beneficial engagement with their system for perinatal data entry.

It may be assumed that the act of entering any data into a perinatal data system equates to engaging in some form. However, considering the definitions of engagement provided in the literature as described above, entering perinatal data does not necessarily signify engaging with perinatal data or the process of entering perinatal data. Engagement is characterised by attributes of user and user system interaction such as, the quality of the users experience (O'Brien & Toms, 2008), their involvement (Cresswell, et al., 2011; Turner, 2012) or sense of being occupied, dedication and absorption (Bakker, 2009). The nine elements identified via constant comparative analysis present the influencing factors on participants during the process of entering perinatal data, informing the core category of **engagement**. However, data analysis identified elements particular to some participants that were not seemingly present in others. These were presented above (p 159-160) within the description of the core category. These participants described effectively overcoming barriers to entering perinatal data, communicated an understanding of the function, benefit and value for both the professional midwifery role and midwifery practice, and in doing so suggested fulfilment of the definition of **engagement as** defined for this research. As alluded to previously, this research did not set out to determine whether particular midwives were engaged with perinatal data and others were not. It is not suggested that any measurement of the level of engagement of any kind was made. Therefore, no percentage or number of how many participants demonstrated beneficial engagement can be made, nor was that the intent. However, an emergence of certain elements synonymous with some participants occurred, suggesting engagement with perinatal data that was not present in other participants. Within the literature, research findings relating to factors among school principals being able to overcome barriers resonate

with this assertion (Bakker, Gierveld & Van Rijswijk, 2006). The authors found that engagement is strongly related to creativity and that engaged participants, in this case school principals, were better able to come up with a variety of ways to deal with work related problems. In this way they overcame barriers which others found prevented them from moving forward in the job (Bakker, et al., 2006).

Furthermore, some participants from this research reported receiving something in return from the process of entering perinatal data into the computer. In essence, they described a ‘reward’, a beneficial engagement with perinatal data. Two examples are presented here:

*Sometimes sitting down to do your perinatal data is your reward after a busy day. I don't mind doing it. I enjoy it. I think well, it probably is a good auditing tool. P4*

*I actually really like it because it gives you the opportunity to sit down, (laughs)... I usually have a cup of tea at the same time. P6*

Such experiences of reward may even have a physiologic basis. It has been proposed that the neural basis of engagement acts to increase the activation of reward and self-regulation circuitry in the users brain (Rock & Tang, 2009). Participants who communicated finding some benefit spoke of a positive relationship with perinatal data and align with **The Theory of Beneficial Engagement**. 30 years of research into motivation and employee engagement by Thomas (2009) has resulted in models that suggest such rewards can be both extrinsic and intrinsic. Extrinsic rewards are usually tangible, such as monetary in nature and are most often controlled by others. These have been replaced in more recent models of employee motivation and engagement with intrinsic rewards that have a psychological basis (Thomas, 2009). Thomas reveals that

the intrinsic rewards which employees get from doing meaningful work and performing it well, drive their day-to-day motivation in their job (Thomas, 2009). Rewards for perinatal data entry, as described by some participants of this research, fall into this second group of intrinsic rewards and in part appear to drive the motivation for these midwives to beneficially engage with perinatal data entry. For midwives, therefore, identification of their individual benefit of engagement with perinatal data is a key, as the process may then give a benefit in return for the effort of entering the data to the midwife user in some positive way. This benefit as was communicated by a few participants, may be as simple as a chance to sit down or as complex as understanding the influence of accurate data that provides accurate statistics, thus improving outcomes for the women in care.

The mandatory nature of software for perinatal data entry removes the midwives ability to choose a system they may find engaging. When searching for information online, a user can chose which browser they use. When retrieving email, a user can choose a web based mail server such as webmail or a specific email program. These choices are not available to midwives entering perinatal data. Research within the psychology domain determines a relationship between choice and motivation. It presumes that engaging in self-prescribed behaviours, that is being given a choice, results in motivation to engage in a task (Patall, Cooper & Robinson, 2008; Ryan & Deci, 2000). Taking away the midwives choice via implementing a mandatory-use system in turn may in turn decrease their motivation to use it and therefore have some impact on their engagement with the system.

Research into workplace engagement demonstrates that the availability of resources facilitates engagement (Bakker, Schaufeli, Leiter & Taris, 2008). Job resources such as social support, supervisor encouragement and performance feedback, are found to provide intrinsic and extrinsic benefits to the employees motivational role via fostering personal growth and attaining workplace goals (Bakker, Schaufeli, Leiter & Taris, 2008). In 2004, a Job Demands-Resources (JD-R) model, presented in Figure 51, was published, linking engagement with job resources. This lead to positive outcomes in terms of performance of workers (Schaufeli & Bakker, 2004). This model is useful for understanding the link between resources and engagement. The motivational qualities of job resources are emphasised in this model, and act to cultivate an employee's willingness to dedicate their efforts to a work task and therefore engage (Schaufeli & Bakker, 2004). This model has some resonance with the **Theory of Beneficial Engagement**: the identified elements from this research being similar to both job resources and job demands and therefore directly affecting engagement.

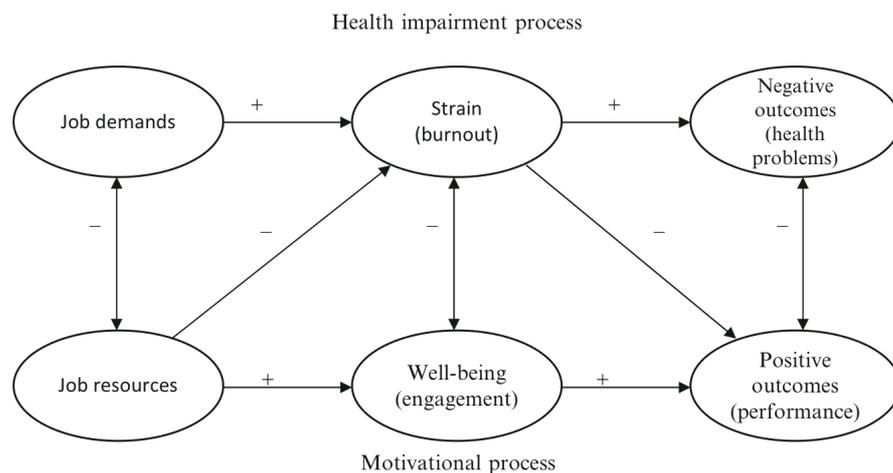


Figure 51: The revised Job Demands-Resources (JD-R) model (Schaufeli & Bakker, 2004)

When an element, such as **software**, poses a barrier to the process of perinatal data entry, it could be classified as a job demand, which has no relationship within this model to engagement. This may change to being a job resource once the barriers to the element **software** are overcome by organisational support or personal growth. An example of an element which motivates the user, **valuing** may act like a job resource that assists the user to engage with their system for perinatal data entry. Reports of this theoretical model being tested by many authors in various workplaces and countries are seen in the literature, where the revised model has been found to be convincing when cross sectional and longitudinal evidence were examined (Schaufeli & Taris, 2014). Such linking within the literature of these factors leading to engagement and positive outcomes, adds strength to the theoretical findings of this research.

A second theoretical model relating to work engagement also has some similarity with **The Theory of Beneficial Engagement**. Maslach and Leiter (1997) developed a model to explain the fit between employees and their work environments leading to greater engagement in their work and decreased levels of burnout. They describe six areas of work life as being antecedents of employee engagement or burnout. These six areas are listed in Table 6.

Table 6: Six areas of work life (Maslach & Leiter, 1997)

- |  |
|--|
| <ol style="list-style-type: none"><li>1. Workload</li><li>2. Control</li><li>3. Rewards</li><li>4. Community</li><li>5. Fairness</li><li>6. Values</li></ol> |
|--|

Testing a modified version of this model, blended with Kanter's theory of empowerment (Kanter, 1993), shown in Figure 52, occurred in research by Cho, Spence Lashinger and Wong (2006) on newly graduated nurses in Ontario, Canada. They found that when the new graduates had access to empowerment structures such as opportunity for learning, and had an overall fit with the six areas of work life, they felt more engaged in their work (Cho, et al., 2006). This model proves useful in understanding how the elements emerging from this research relate to engagement, given that some of the six areas defined by Maslach and Leiter (Maslach & Leiter, 1997) are similar to the elements of this research, namely workload, reward and values. Further to this, Bakker (2008) describes the link between engagement and improved job performance. In the case of this research, this may result in beneficial engagement leading to improvements to accuracy as well as timely completion of perinatal data records by midwives. However, the research by Maslach and Leiter (1997) informing the model presented here, finds engagement as the antithesis of burnout, with burnout being their focus. This contrasts with the theory presented from this research, which found engagement to be a possible solution to the barriers described by participants in relation to the process of perinatal data entry into the computer.

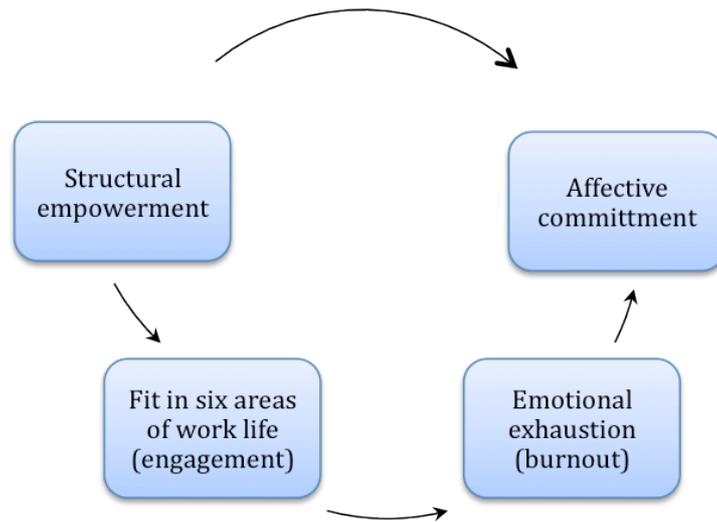


Figure 52: Model linking Kanter's empowerment theory (1993) with Maslach and Leiter's (1997) six areas of work life (Cho, et al., 2006).

Personal resources are also discussed in the literature concerning workplace engagement (Bakker, et al., 2008). These are purported to be characteristics such as self-efficacy, self-esteem and optimism which promote engagement when present in an employee (Xanthopoulou, Bakker, Demerouti & Schaufeli, 2009). Definitions of engagement for this research include the notion that the work task requires alignment with the employee's expectations (Cresswell, et al., 2011) and is experienced as positive and fulfilling (Bakker, 2009). Midwives who experience the process of perinatal data entry as positive, align with these definitions and resonate with the personal resources identified in the literature as contributing to work engagement. In this research characteristics found in this research to be suggestive of beneficial engagement included: general communication of a positive attitude to perinatal data entry and desire for others to share this optimism showing the presence of elements similar to personal resources.

It is acknowledged that there will be an integration phase for new users of any system. During such a phase, time, professional development and investment are required (Ajami & Mohammadi-Bertiani, 2012). This is true for perinatal data entry. The theoretical findings of this research suggest that even novices can move towards beneficially engaging with the system for perinatal data entry, because the elements that emerged are not specifically related to a level of experience as a midwife. The theory proposes that a beneficial engagement may occur through the modification and optimisation of some or all of the elements. This may be achieved through professional development, organisational and technical support as well as provision of information to increase insight into why the system is important. This will then lead to greater awareness of its value and benefit for midwifery practice. It is important therefore that understanding the relevance and purpose of the system occurs even at a very early stage.

Therefore finally, **The Theory of Beneficial Engagement** proposes that modification of the identified elements participants experience in relation to perinatal data entry to an optimal state may lead to all midwives beneficially engaging with the perinatal data entry process. It is purported that in order to overcome barriers to perinatal data entry, modification of any, some or all of the elements of engagement may lead to achieving more timely, complete and accurate perinatal data entry into a computer. The theory is therefore fluid and dynamic, or person centred rather than evenly weighted or requiring all elements to be optimised for beneficial engagement to occur. The person-centredness recognises the individual nature of human knowledge and experience.

Although this is a substantive theory and not conceptualised to formal theory, the premise can be translated to other computer systems or other groups utilising such systems. Translation of this theory proposes that any computer system can have an identified, individual set of elements that work either to enhance, or act as barriers to engagement with particular software. Identification of these elements for any system and its group of users as well as the resulting modification of them to an optimal state, may lead to users, becoming beneficially engaged with the software. In this way, **The Theory of Beneficial Engagement** may be translatable to any mandatory use software operated by users to achieve workplace goals.

### Discussion of elements

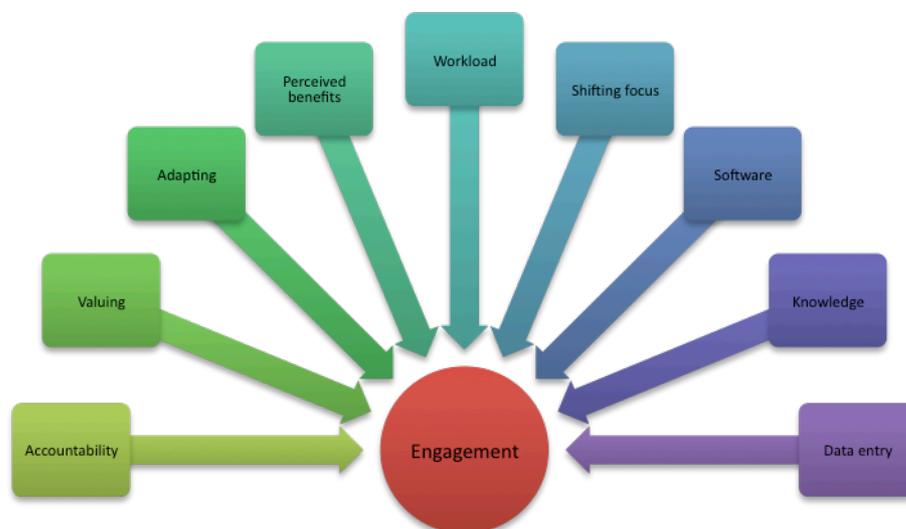


Figure 53: Elements of Engagement

As illustrated in Figure 53, the core category **engagement** is informed by nine elements. These are **accountability, valuing, adapting, perceived benefits, workload, software, shifting focus, knowledge and data entry**. The findings leading to identification of

these elements are grounded in the data informing the core category. In order to fully explicate their meaning, the elements will be situated within the current literature, thus presenting the contribution this research makes to knowledge. The relationships between elements will be discussed to further demonstrate the substantive theory developed. This chapter will now explain each element and the contributing themes in greater detail.

### Accountability

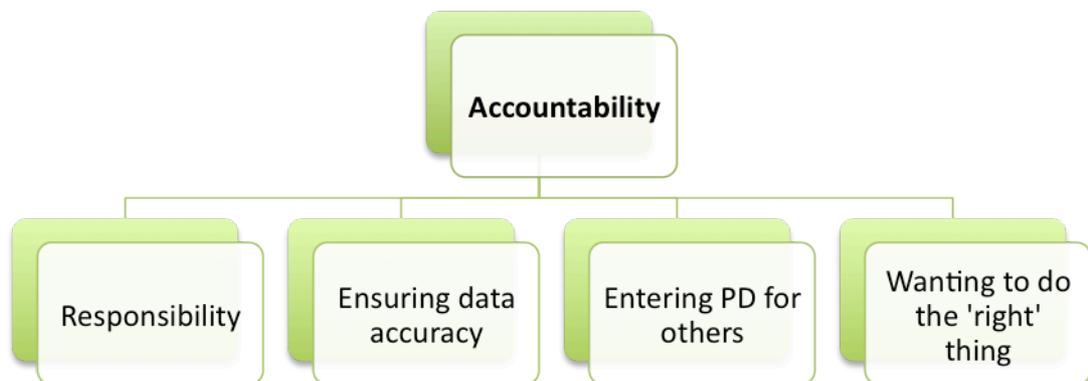


Figure 54: Element – Accountability

Accountability in this instance is related to practice and as such is professional. Professional accountability for midwives is embedded in the standards of practice set out by the Nursing and Midwifery Board of Australia, and is specified in the document: National competency standards for the midwife (Nursing and Midwifery Board of Australia, 2006). This document, which can be found at

<http://www.nursingmidwiferyboard.gov.au/Codes-Guidelines-Statements/Codes-Guidelines.aspx>

is current at 16 December, 2013 and states that the midwife: “... accepts accountability and responsibility for her actions...(and) documents practice according to legal and professional guidelines and procedures” (Nursing and Midwifery Board of Australia,

2006, p. 2). Furthermore, the midwife is expected to demonstrate competence in technological literacy. In relation to the findings of this research surrounding the element **accountability**, this standard of professional accountability and required competence in use of ICT aligns directly with the entry of perinatal data. It has been stated in the literature that “Users, many of whom generate the data in the first place, need to take more accountability for the quality of the data and how they need the data presented, for it to be of value” (Hansen, 2011, p. 10). This research asserts that professional accountability in relation to perinatal data entry must be fully accepted by midwives who are then held accountable for the consequences of the outcome of that entry or failure to enter. In turn, the presence of such accountability informs the core category of engagement via instigating motivation to engage with perinatal data entry and its timely completion. As acknowledged by Halm (2011), it is the motivation of the employees that makes a health care organisation come to life, and engaging employees to enhance performance and profitability is the challenge of the future.

The key findings for the element **accountability** were:

- no governance existed where midwives were held to account for personal perinatal data entries
- shared responsibility for perinatal data entry between midwives and perinatal data coordinators
- corrections completed by perinatal data coordinators rather than the user who made the error
- password sharing was a regular occurrence
- participants wanted to do the right thing and believed they were

The contributing themes to the element **accountability** will now be discussed with reference to related literature.

## Responsibility



Figure 55: Responsibility

This research found that, despite a requirement that midwives enter perinatal data into a computer for the mothers and babies in their care, or pass it on to a midwife on the next shift to enter it, management within maternity units does not allocate any one person to be responsible for the entry of perinatal data for a particular woman. In addition to this, there generally appears to be no consequences to the midwife for empty, incomplete or incorrect entries. Due to password sharing and shared perinatal data entry for individual records, there is no way to accurately track who entered the data for such monitoring to occur, should it even be attempted. There is no sign off for a perinatal data entry on the computer system, or space allocated for such sign-off, on the care plan, or within the medical record. As a result, the responsibility felt by midwives for perinatal data entry for the mothers and babies in their care is reduced. Within business literature for example, this is termed role confusion (Smith & Erwin, 2007) Role confusion occurs in a system without clearly established roles and responsibilities, as well as direct

accountability belonging to one person who signs off on work completed. Although its development is not clearly attributed to one author, Smith and Erwin (2007) describe the Responsibility Assignment Matrix (RAM), which is especially useful in clarifying roles and responsibilities in multi-use projects and processes. This matrix focuses on the actions that must be accomplished in a process to deliver an end product or service. These authors explicate the factors that contribute to RAM and that the manager is not accountable for everything in the organisation. Assigning responsibility via this matrix ensures accountability is placed with the person who performs the work. Often the person who is accountable for a task may also be responsible for completing the task. Within this research, without assignation of responsibility or accountability, no one person can be followed up for perinatal data entries and thus the responsibility transfers to the perinatal data coordinators. These findings support the findings of Lluch (2011) who, in a systematic review, found that liability and accountability concerns have not yet been addressed in most healthcare systems.

The findings of this research suggest that assignation of personal responsibility and accountability for perinatal data entry to midwives is clearly missing. The responsibility assignment matrix is considered effective in assisting with the task of identifying roles and responsibilities and communicating levels of authority in ICT governance (Lapao, 2011). When the system of responsibility fails, role confusion sets in leading to out-of-balance workloads, blaming of others for not getting the job done, lack of action and poor morale. Gajanayake (2011) identifies that the presence of an accountability system tends to ensure that all involved parties follow procedures correctly. A lack of such a system in regard to perinatal data entry leaves midwives open to doing as they choose,

creating opportunity for inconsistency in perinatal entries between individual midwives as well as across units.

The data from this research suggests that responsibility is most often assumed by the perinatal data coordinators whose job it is to validate the data for submission at the end of each month. Incomplete and incorrect entries are returned as errors or queries during the process of validation, leaving the coordinator to do the corrections to the best of their ability in the time allocated to them, so that submission to the Data Collections Unit of Queensland Health can be timely. However, the findings of this research identified that aside from the perinatal data coordinators, particular midwives take on the responsibility of correcting their own errors. It was found that they do so voluntarily; personally following up on the perinatal data for the mothers and babies they have cared for, to ensure that what is recorded is an accurate representation of what actually happened. These participants also personally ensured that the entries accurately reflected the data in the medical record. This demonstration of a personal responsibility for perinatal data points toward midwives engaging with perinatal data and the process of entering that data into the computer. Such motivation to find extra time in their busy day for this activity resonates with the definition of engagement outlined in the literature, demonstrating a perceived user control (O'Brien & Toms, 2008) for the perinatal data of women in their care. So even though the use of whatever system their workplace provides is mandatory, some participants exercised control over the accuracy of the data for women in their care, thus engaging with perinatal data. This engagement also indicates that they value the quality of the perinatal data for mothers and babies in their care. This fulfils the definition of beneficial engagement for this research.

## Ensuring data accuracy

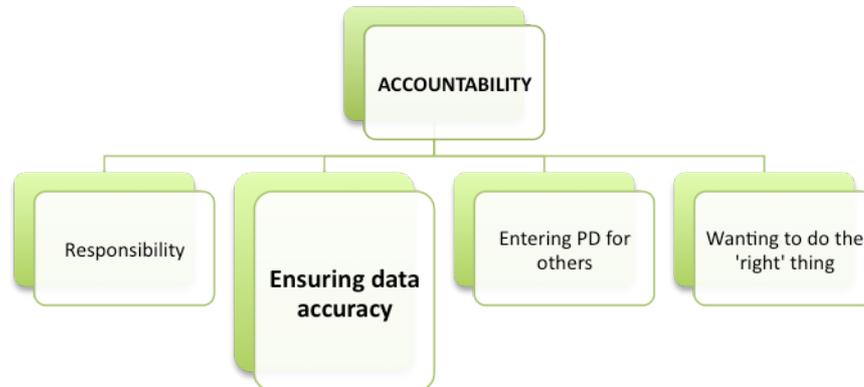


Figure 56: Ensuring data accuracy

Midwives are concerned about the accuracy of data in perinatal data records (Craswell, Moxham & Broadbent 2013a). They hold the belief that perinatal data should be and generally is, accurate. However, this research found that in parallel with maternity management's lack of call for accountability for perinatal data entries by any one midwife, errors are generally corrected by other midwives or by the perinatal data coordinator rather than the midwife who made the error. This not only reduces the responsibility felt by the midwives who made the error, because sometimes they might not even know that they had indeed made the error, but also relates to the element **knowledge** and a lack of follow-up professional development that correcting of personal errors would provide. Logic assumes that the activity of correcting self-made errors would reinforce the correct data requirements so that errors are not made repeatedly. Experimental studies on animal intelligence by Thorndike, published in 1911, support this logic and are still referenced in neurological research today (Klein et al., 2007). Research in other health-related disciplines such as psychology, reinforces the practice of correcting self-made mistakes. It is reported that when students who failed tests were given immediate feedback on their mistakes, greater retention of the

correct answers was produced (Hays, Kornell & Bjrok, 2012). Coupled with the finding that midwives do not always know that perinatal data entries are returned with errors for correction by the Data Collections Unit, a false sense could be created that the data they enter and is submitted is accurate. The validation function within some versions of perinatal data collection software may also contribute to a midwife's false sense of security regarding data accuracy.

A reliance on the validation feature, nested within some software for perinatal data collection, to find errors may also lead to further inaccuracy in the data entered. Generally, validation occurs as a result of business logic, the part of the software that encodes the business rules that determine how data can be changed, created, displayed and stored (Lieberman, 2012). Data validation rules refer to the logical checks on data entered into the database against predefined rules for value ranges (Gliklich & Dreyer, 2010). For example; year of birth must be logical consistency with other data recorded for the same woman and could not be prior to 1950. What validation does not and cannot do is ensure that the data entered is the correct data. Accurate data entry lies with the person inputting the information.

## Entering perinatal data for others

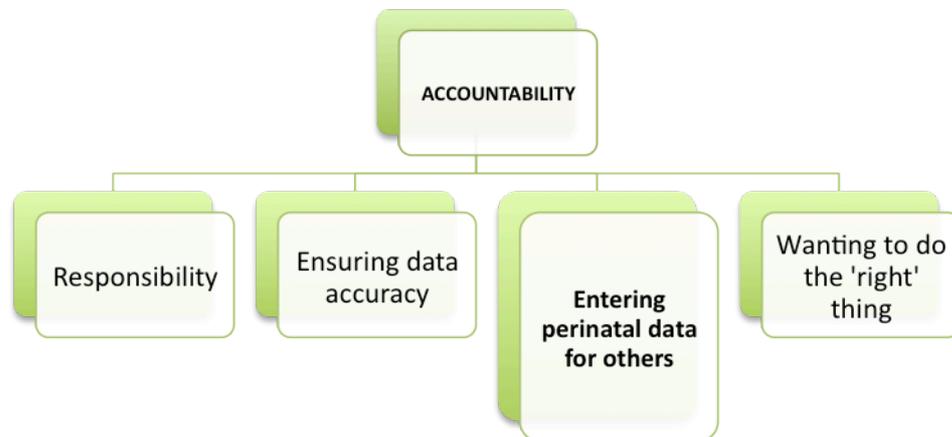


Figure 57: Entering perinatal data for others

It became clear from this research that sharing the entry of perinatal data occurs across units by all midwives. This sharing occurred most often when units were busy or staffed with casual or agency staff; the former usually leading to the latter. The frustration felt by participants as a result of this, particularly when an entry was found to be empty on mother's discharge requiring the midwife to start from the beginning, was evident.

*If you don't do it, then one of the other colleagues has got to do it, so if that's ever happened to you, then maybe that's a bit of a learning curve not to leave it because you know the buck's got to stop with someone. P4*

Entering perinatal data for women who are not directly in that midwives care requires transcription of the data that is recorded in the medical record. Participants suggested that often this data was difficult to locate and took longer to enter.

*If all the forms hadn't been sorted out correctly, to begin with, you know like if she's a negative blood group or any complications or whatever, it would take a long time. P6*

Perinatal data entered by someone other than the attending midwife was said to take more time and was described as being less complete and accurate. Entering perinatal data for others potentially reduces the effort made by the midwife to complete the

record and increases the frustration experienced. Within the field of research into computer supported cooperative work (CSCW), it is reported that tension exists when an information object is shared between multiple workers in relation to unevenly distributed workload (Grudin, 1994; Zhou, Zheng, Ackerman & Hanauer, 2012). Recent research evaluating a shared patient Problem List, as a mandated component of an EHR, identified similar issues of frustration among users relating to forced collaboration, leading to suboptimal utilisation of the tool which stemmed from a deviated understanding of its purpose between different users (Zhou, et al., 2012). Such collaborative documentation is a standard feature of the EHR and with the spread of this technology, will become standard practice in environments utilising these tools. Perinatal data records are accessed and changed by many different midwives over the time they are in use; from first entry in the antenatal period to discharge of the mother and baby. They exist as collaborative documents without clear identification of who is responsible for each component.

The data informing this theme of entering perinatal data for others, impacts directly on **engagement** because users may experience feeling less responsible for the perinatal data of women they have not cared for and become frustrated with the process. This may result in being less involved and having a diminished desire to enter complete, accurate and timely data. Research has identified frustration as harmful to workplace engagement and engaged employees (Royal & Agnew, 2012). These authors found that frustration of this type existed in employees where work conditions kept them from being as productive as they could be. The findings of this research resonate with this scenario when midwives are put in a position to have to enter perinatal data for others.

Password sharing was seen as a solution to the issues of entering perinatal data either when a staff member did not have access to the system, had forgotten their password or had been locked out of the system. The fact that participants were willing to admit they shared passwords and observed others doing it, suggests that the practice is widespread and that there is little understanding or acknowledgement of the breach of security that occurs with this practice. According to the policy of Queensland Health, the public and main healthcare provider in Queensland, the sharing of passwords is considered a breach in security of access to confidential data, with point 4.3.3 of the Guideline for User Responsibilities stating “Passwords must never be revealed to anyone, including your superior” (Queensland Health, 2013, p. 2). Guidelines regarding confidentiality exist within most healthcare agencies and in many industries in an effort to maintain confidentiality and privacy of medical records and information (Australian Government, 2013; U.S. Department of Health & Human Services, 2001).

Other healthcare institutions have reported similar password sharing issues as identified by Baskaran, Davis, Bali, Naguib and Wickramasinghe (2013). Their research was focused on privacy, confidentiality and security of newly implemented electronic health records in a maternity unit in England. They found that the number of passwords, as well as the requirement of changing passwords regularly, was seen as a nuisance factor by staff. Similarly, it has been found that use of multiple passwords can lead to frustration with researchers recommending that streamlining of password requirements is necessary (Riley, 2011). Likewise, research has also found remembering one’s password to be a factor in creating negativity to the use of ICT in healthcare

(Darbyshire, 2004; Hegney, et al., 2007). Sharing of passwords has also been reported in the literature examining healthcare workers using ICT (Timmons, 2003). The identified reason for sharing was being too busy to use the computer. Sharing passwords leads to the problem of not being able to track who has entered what data should a system of individual accountability be instated. It was outside the scope of this research to clarify whether midwives were aware that by sharing passwords they are in breach of healthcare institutional policy. Professional development regarding the appropriate use of passwords, as well as timely password replacement once a user is locked out, needs to be considered in an effort to stop the practice of password sharing. However, without password sharing, when users are locked out of the system, the task of entering perinatal data falls to others. This was found to lead to the potential for a lack of **engagement** by the midwife who was requested to enter the data from the medical record. This relates to the theme support contributing to the element **knowledge** and a need for provision of services to ensure that users who are locked out can be reinstated in a timely manner.

### Wanting to do the ‘right’ thing



Figure 58: Wanting to do the ‘right’ thing

Altruism, which can be described as a selfless concern for the welfare of others (Farlex, 2013), is seen within the literature as a key determinant of moving into the profession of midwifery (Pollard, 2008). The participants taking part in this research were no different. The findings showed they were not acting maliciously by trying to leave perinatal data un-entered or by deliberately miss-entering data, but were genuinely concerned about accuracy of the data and talked about wanting to do the right thing.

*...I have to do things right. I couldn't just make it up, something that wasn't there. I would rather spend the time going to look. I couldn't even think of putting something in that I'd made up. I couldn't do it. I wouldn't do it. P12*

Within the literature, nurses are widely acknowledged as the group of healthcare professionals who are more likely to report error (Flynn, Liang, Dickson, Xie & Shuh, 2012; Johnstone & Kanitsaki, 2006; Mayo & Duncan, 2012; Robinson & Hughes, 2008). However, as with all human input, honest mistakes and accidental errors can still occur. Education of midwives regarding the relevance and significance of gathering perinatal data, as well as knowledge-sharing about its use, the selection of data items that are mandatory for collection, and the allocating of responsibility for perinatal data entries, may contribute to improvements in data entry and thus a resultant decrease in midwife data entry errors. It could be assumed that midwives wanting to do the right thing will fulfil the requirements management requests of them with the knowledge that such action will lead to better outcomes for the women in their care. In doing so, they may choose to engage with the process of perinatal data entry into the computer once that understanding is shared.

**Accountability** informs the core category of **engagement**, and this discussion on the contributing themes to this element demonstrates their relationship with the literature. As stated earlier, accepting **accountability** for perinatal data entry may act as a motivator for midwives to engage with the process of entering accurate data in an effort to fulfil their professional responsibilities. Such motivation can then work as a feedback loop of offering the midwife reward for effort with such experience of benefit. This could consequently lead to a desire to continue **engagement** with perinatal data. This has similarities with the JD-R model, in which Schaufeli and Bakker (2004) describe a feedback loop where job resources such as learning led to increased competence and a positive work-related state of mind or engagement through achieving work goals. This demonstrates the strong relationship that exists between the elements **accountability** and **perceived benefits**.

There exist complex inter-relationships between all emerging elements in addition to their direct relationship with the core category, **engagement**. As discussed above, the element **accountability** relates to **perceived benefits**. **Accountability** also relates strongly to the element **valuing** as those participants who communicated feeling responsible for the entry of perinatal data entry for the mothers and babies in their care also communicated valuing perinatal data. This was demonstrated via their focus on perinatal data and the importance of accurate data. In this light, recognising a value for the act of entering perinatal data relates to the themes contributing the element **Accountability**. That is the responsibility felt, ensuring the data entered is accurate, and a desire to do the right thing. This relationship is reciprocal as it could be proposed that those who value perinatal data also recognise a responsibility for entering data for the

mothers and babies in their care and therefore can be held accountable for the data entered. These relationships are shown in Figure 59.

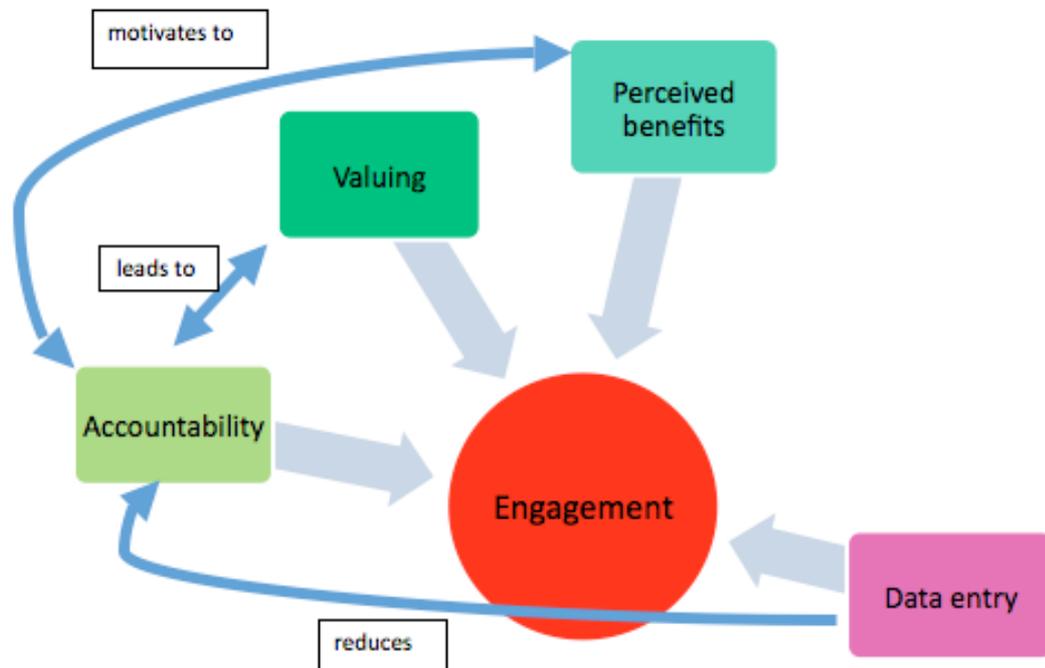


Figure 59: Relationships for the element accountability

A further relationship shown here of **data entry** reducing **accountability** will be discussed further on with that element. The element **Valuing** and contributing themes importance of accurate data and focus on perinatal data will now be discussed.

## Valuing

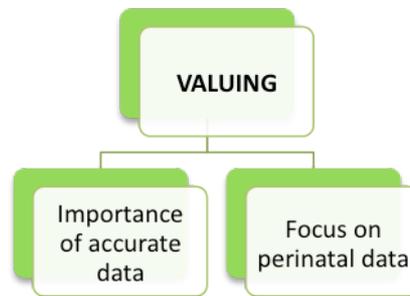


Figure 60: Element – Valuing

The key findings for the element **valuing** were that midwives who placed value on perinatal data entry:

- valued accurate data in any format i.e. online and on paper
- valued accurate perinatal data so it would be meaningful
- focused on perinatal data

However not all participants or the midwives in their experience valued perinatal data entry.

This research found that participants, who valued the data wanted it to be accurate. This element emerged as data coalesced via the themes of the importance of accurate data and focus on perinatal data. The connection between value and accuracy, expressed by some of the participants in this research, contributed to their beneficial engagement with perinatal data. Other authors have identified such an association, an example of which is seen in research with 1170 members of the Barcelona Nurses Association by Lupianez-Villanueva et al. (2011). These researchers found that those who valued ICT did so in making its use an integral part of their practice. Similar findings were seen in the literature looking at implementation of electronic documentation and ICT within

healthcare (Management Sciences for Health, 2011; Nursix.com, 2004; van Gemert-Pijnen, et al., 2011). It was necessary to articulate the value of an ICT system when preparing staff for a planned system implementation (Ward, et al., 2008).

Research by Karahanna, Agarwal and Angst (2006) examined whether users found ICT systems to be appropriate as a means of fulfilling their work. Their study suggested that compatibility with a system can be divided into four distinct constructs; compatibility with existing work practices, with preferred work style, with prior experience and with values rather than as a stand-alone dimension. They tested this on a sample of 278 users of a mandatory computer system within customer relations of a large bank. The researchers argued that users' personal values and beliefs predicted the usage behaviour in mandatory use systems (Karahanna, et al., 2006). Extending these findings, Hennington et al. (2011) asserted that in mandatory use systems, personal values define system use and affect feelings about professional roles. It was found that users who perceived the use of ICT to be aligned with their personal values were less likely to experience role conflict (Hennington et al., 2011). More importantly, if system use does not align with such values, the user may actually be less productive in using it. These users were found to develop 'work arounds', decreasing the organisation's adoption of ICT systems in terms of accuracy and efficiency (Hennington, et al., 2011). Solutions to realigning values to the ICT system in use were suggested and included education in the benefits of ICT use at the implementation phase (Hennington, et al., 2011). Similar findings were earlier reported by Rahimi et al. (2008, p. 618) with their qualitative case study involving 40 interviews with healthcare workers and a document analysis. They found participants were requesting information on the value of ICT systems to the users

prior to implementation. It was important to provide information which could answer the question “What’s in it for us”.

Building on such findings, an element of a beneficially engaged midwife as described in the definition of engagement for this research, is the belief in the value of perinatal data. This results in value for the means for entering that data, the computer system. This was exemplified in the findings via an understanding that quality information ‘out’ depended upon a prerequisite of accurate data ‘in’. The participant users valued their own time, and saw it as wasted if the data entered was not accurate. The actual uses for perinatal data such as, a print-out contributing to the discharge summary for the General Practitioner, as well as the use of the data summary for assignation of clinical codes for funding, contributed to the awareness of the importance of accurate data and value for the system necessary for its entry. However, not all participants were aware of this. Thus, educating midwives about the uses for perinatal data, the benefits of entering accurate perinatal data and the direct influence that their contribution to the perinatal data collection makes to the mothers and babies in their care, may assist in encouraging midwives to value the process. In aligning their personal values of system-use in this way, a beneficial engagement with perinatal data may occur. Educational experiences challenge unquestioning acceptance of expectations, thereby changing traditional values (Rokeach, 1979; Schwartz, 2006). Data analysis undertaken for this research indicated that some educational experiences may in turn increase the midwife’s focus on perinatal data and encourage checking of personal entries more thoroughly, as well as following up on the perinatal data of mothers and babies in their care. This discussion demonstrates the relationship of this element to the element **knowledge**, discussed later

in this chapter. It may be proposed that such professional development can work to optimise the element **valuing**, thereby contributing to beneficial engagement and reducing role conflict and potential attrition of experienced staff from the midwifery workforce. Moreover, in order for users to value the use of ICT within the workplace, systems need to be accessible, easy to use, compatible with current workflow and provide comprehensible benefits to the user (Gerrish, et al., 2006; Hughes, 2003). This in turn highlights the relationship of the element **valuing** with the element **software**. This relationship could be considered reciprocal as when a system is easy to use and functions well with workflow, it may have a greater chance of being valued by the users. The relationships are shown in Figure 61.

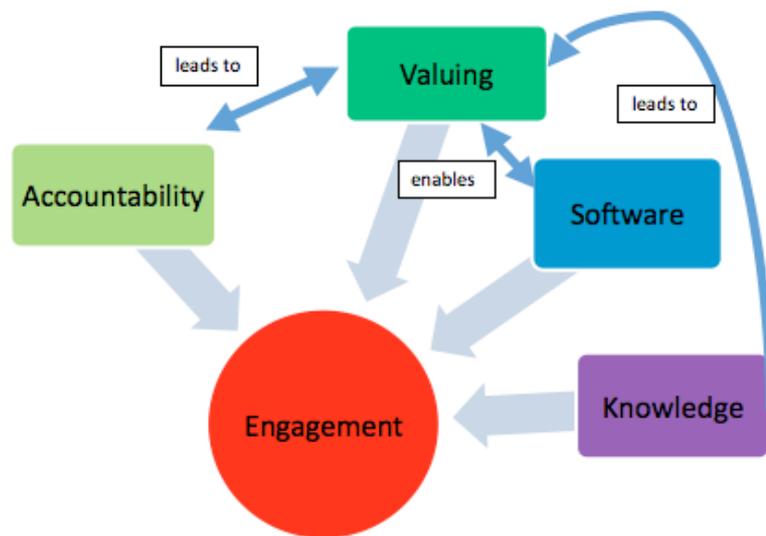


Figure 61: Relationships for the element valuing

## Adapting

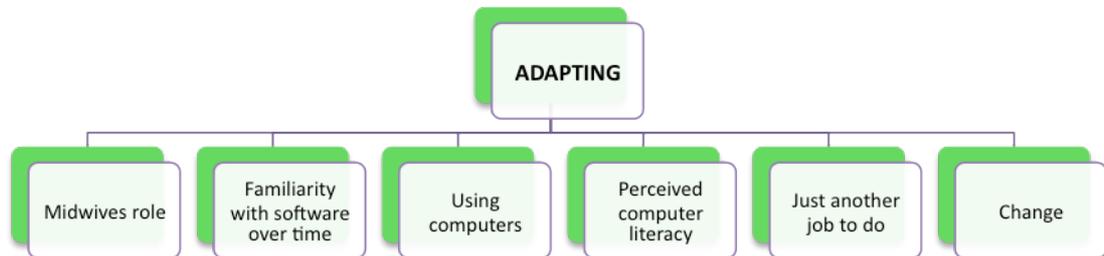


Figure 62: Element – Adapting

It has been stated that “... paper based systems have many weaknesses which may be forgotten through the haze of nostalgia” (While & Dewsbury, 2011, p. 1308). Adapting to technological change challenges current work practices, particularly workflow, and for adaption to be complete requires acceptance (Laramee, et al., 2012). The key findings from the element **adapting** were:

- entry of perinatal data using computers was not always accepted as part of the midwives’ role
- adapting involved overcoming fear, resistance to change and technology
- adaption was perceived as precursor to successful use
- participants perceived adaption hinged on the aging midwifery workforce
- learning by experience and from others, familiarity with the software and perception of personal computer literacy all contributed to adapting

Issues related to adapting to computers for perinatal data entry emerged via the themes of midwives role, familiarity with software over time, using computers, perceived computer literacy, just another job to do and change.

## Midwives role

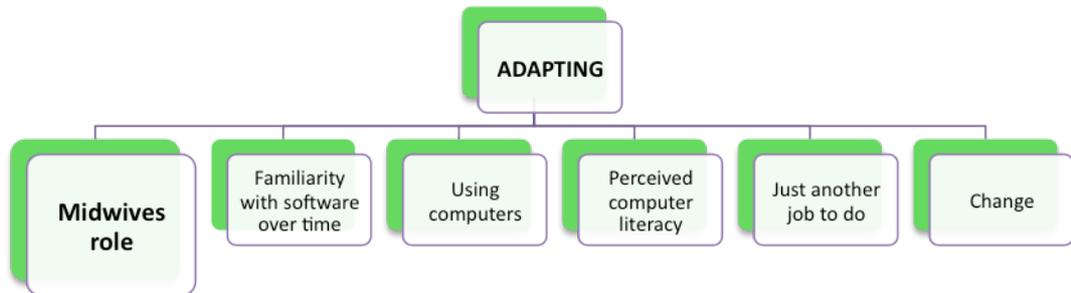


Figure 63: Midwives role

The findings from this research revealed that participants had some difficulty in incorporating the use of computers for perinatal data entry into their role as a midwife. Traditional paper charting was accepted as part of the midwifery role and was seen as a priority. However, when perinatal data entry moved to an online format, some participants revealed that they placed less priority on entering the data, believing that the use of such technology was not part of their midwifery role. It was also found that participants saw this to be the perception of others, such as inpatients or visitors. Participants described that sitting at the computer could be interpreted as doing something other than midwifery work.

In Australia, midwives are educated in a particular way and then work in a particular role. Midwifery practice traditionally involved mostly ‘hands-on care’ of mothers and babies, with the documentation of that care occurring on paper charts. Such traditions evolve within each profession and become a unique culture, involving rituals, skills, practices, beliefs and values (Arndt, et al., 2009). Changes to such accepted traditions, like that of the perceived midwifery role, when not congruent with a midwife’s beliefs,

can lead to role conflict and role stress (Davies & Iredale, 2006; Lindberg, Christensson & Ohrling, 2005; Madsen, 2011). The potential for role conflict exists for those who deem ICT use to be inconsistent with the values and beliefs around their role (Hennington, et al., 2011), and being exposed to role stress for long periods leads to burnout (Mollart, Skinner, Newing & Foureur, 2013). Adding to this, when midwives are required to make significant change to their professional work role, there are going to be physical and emotional challenges (Patterson, 2005).

It has been reported that midwives generally feel that their role has become more limited (Homer et al., 2009) and their professional identity has been challenged by technology (Larsson, Aldegarmann & Aarts, 2009; Madsen, 2011). Within the literature, research into the development of electronic patient records (EPR) in maternity services has found that midwives define their work in opposition to computers, seeing ICT work as anti-ethical to the core ‘women centred’ philosophy of midwifery (Henwood & Hart, 2003, p. 249). Such opinions align with the notion articulated by some participants, that entry of perinatal data should be done by administrative rather than clinical staff. As computerisation of more and more documentation acts as a catalyst toward the goal of a single point of data entry (Fadly, et al., 2011), midwives will be required to document via computer, and perinatal data items will be extracted from the system. This is already occurring in units with a Health Information System or Electronic Health Record, as described as a part of this study by participants from such units. So, just as current documentation in paper medical records is accepted, recognition of the use of technology as an integral part of the midwives role also needs acceptance. Research from the UK suggests this is not happening in the nursing

profession finding that nurses, nursing students and their university educators do not see health informatics as a clinical skill or an integral part of their role (Spiste Bond et al., 2009). The participants of this research suggest that midwives hold similar beliefs.

The finding that participants were concerned about other people's perceptions of their use of computers is also apparent in the literature. Admitted clients' perceptions of nurses using technology were found to focus on concerns about data accuracy and privacy and that they were seen to value nursing care over ICT use (Lee, 2007). Lee (2007), in research about clients' perceptions of nurses using personal digital assistants (PDA's) at the bedside, also found that clients wanted the use of ICT explained to them, so that they had a clear understanding of what the nurse was doing when using technology. More recent findings suggest that if admitted clients are informed about the use of a computer in their care, they accept it more readily (Strauss, 2013).

Aligning workplace needs and expectations with tasks required to be completed in the workplace is suggested by Cresswell et al. (2011) as facilitating engagement of clinical staff with an EHR. However, they found that, although this was the case at the outset of implementation, over time a lack of involvement in the decision making regarding equipment purchased, implementation timelines and difficulties with the system resulted in disengagement of users. This suggests that even if the midwife's expectations of systems such as those for perinatal data entry are in alignment with their perception of their role, barriers to use can work against efforts to promote engagement. Such tensions related to the perception of the midwives role create a negative environment for the introduction of ICT for perinatal data entry. Yet increasing the use

of technology within healthcare is occurring at a rapid pace. This means midwives will be required to accept computing as part of their role, or risk being left behind while other healthcare areas move forward, embracing what technology has to offer. This research revealed participants who communicated beneficially engaging with perinatal data, and described an acceptance of computer data entry as part of their role. Such beneficial engagement enabled them to see the advantages to the women in their care that technology for perinatal data entry brings, thus overcoming barriers for successful use.

### **Familiarity with software over time**

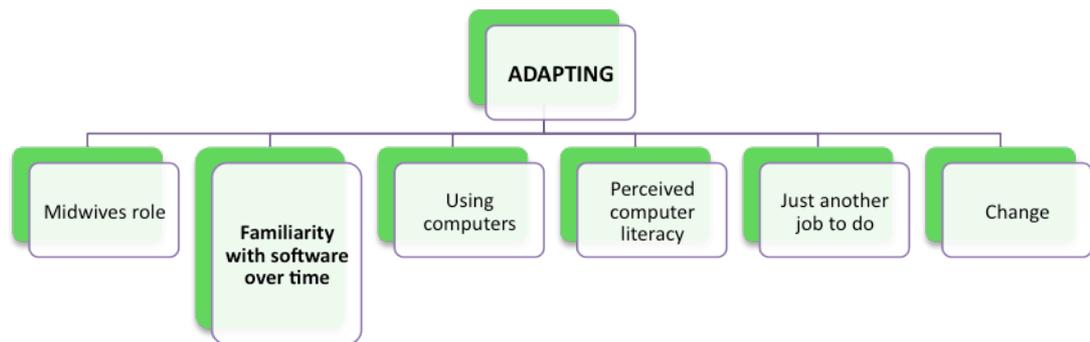


Figure 64: Familiarity with software over time

Findings from this research which identified that participants learned their approach to perinatal data ‘on the job’ align with the theory of experiential learning (Kolb, 1984), nested within the education domain. Kolb states “learning is the process whereby knowledge is created through the transformation of experience” (1984, p. 38). This learning process can be seen in the process of midwives becoming more familiar with software for entering perinatal data as they gain experience over time. Kolb’s theory of experiential learning moves through four stages: concrete experience, observation and

reflection, forming abstract concepts and testing them in new situations. An example of successful experiential learning in ICT and healthcare workers was demonstrated with a group in a university medical centre in Tennessee, USA (Sittig, et al., 1995). The participants were introduced to software for routine client admission and discharge which was to be managed by the nursing staff rather than administrative clerks. The 138 nurses involved were to be trainers or super-users for the system, and were educated via computer-aided software to supplement their classroom learning. Results of this case study showed that experiential learning via computer was successful in matching the pace of learners of differing abilities, and providing all users with a common set of skills and knowledge of the system (Sittig, et al., 1995).

Participants of this current research used a number of resources to help them learn the process for perinatal data entry. These resources included personnel, such as other more knowledgeable staff, and experiential learning which incorporated trial and error. Champions (Cresswell, et al., 2011) or the IT nurse or midwife (Henwood & Hart, 2003; Jones, et al., 2006), described in the literature as assisting in the successful implementation and use of ICT resonate with this finding. Over time and with continued use, participants of this research described how they became more familiar with the software and therefore adapted to the use of computers for perinatal data entry. Similarly, using other software assisted users to progress through their learning. As a result of midwives using other systems in their daily work, they learned better ways to adapt to using software and translated this learning for use in perinatal data entry. However, using multiple systems was met with frustration by the participants with regard to the duplication of data entered into each of several different systems.

## Using computers

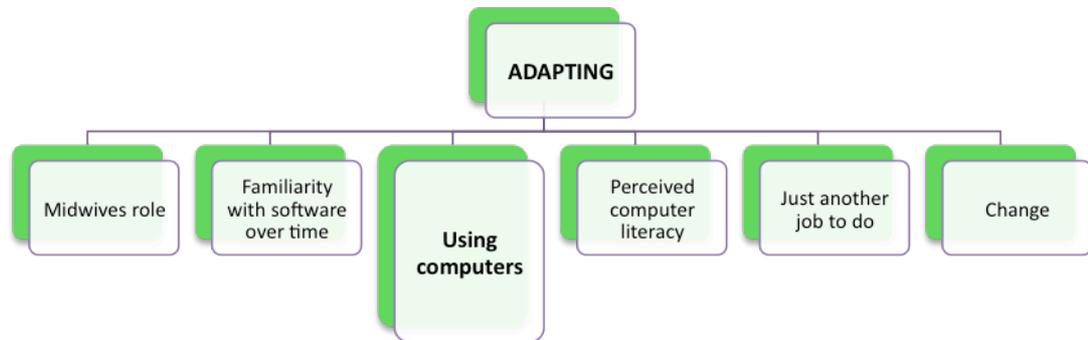


Figure 65: Using computers

Findings from this research suggested that users who either liked using computers, or who described growing up with them, adapted to the use of systems for perinatal data entry more readily than those with an aversion to such use. This finding resonates with research undertaken by Ammenwerth, Iller and Mansmann (2002), Eley et al. (2008a) and Huryk (2010) who found that increased computer experience related to more positive attitudes to computer use. Participants who had an aversion to using computers expressed being fearful of losing data because they had not saved it, or fear of someone altering information they had entered. Arguably, this implies some lack of understanding of computer systems and how they work; it implies a fear of the unknown. For example, even in a simple word processing document, a hidden log or metadata contains a record of everything done from start to finish, a revision history showing who touched the document, and when (Microsoft Corporation, 2013). Knowledge about the nuances of how computer systems work may act to remove such fears (Akhu-Zaheya, Khater, Nasar & Khraisat, 2013). It may also improve adaption to use of the computer for perinatal data entry and throughout midwifery work. Reference by participants to the ubiquitousness of technology in society, even within maternity

settings, demonstrated awareness of the change that technology is forcing throughout humanity (Greenfield, 2008). Use of electronic media in childbirth for self-educating, knowledge gathering and labour management by a new generation of child-bearing parents is occurring with increasing speed requiring midwives to keep pace (Fleming, Vandermause & Shaw, 2014).

Participants' acknowledgement that paperless systems were beneficial to the environment contributed to them **adapting** to using computers for perinatal data entry. Literature examining midwifery response to climate change is scant and is mostly discussion in nature. However, it is suggested, that going paperless is one of five ways nurses can help the environment (Lauer, 2009). In a position statement, the International Council of Nurses (ICN) has identified climate change as an important issue for the nursing profession (ICN 2008). Further to this, it is acknowledged that nurses and midwives are concerned about the environment and share concerns about sustainability (Watterson, Thomson, Malcolm, Shepherd & McIntosh, 2005). Participants of this research were no different. Such concerns may assist in an increase in adaption to using computers for perinatal data entry. Environmental concerns may also be seen as a benefit toward greater use of ICT, therefore potentially beneficially engaging midwives in perinatal data entry.

## Perceived computer literacy

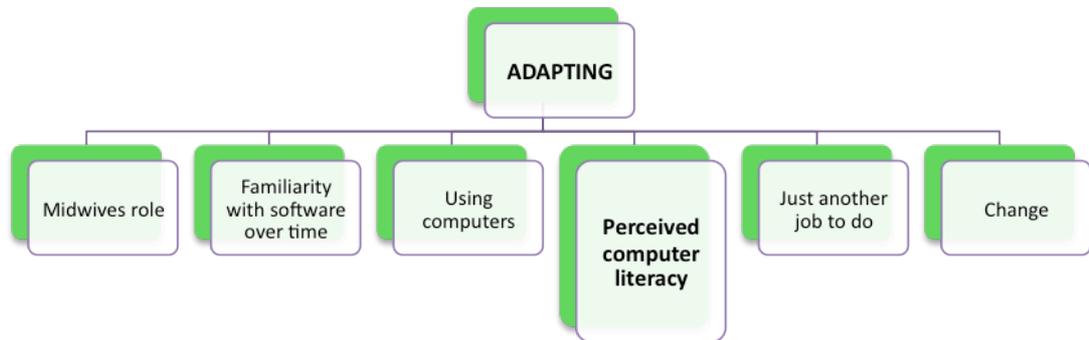


Figure 66: Perceived computer literacy

The ‘typical’ Australian practising midwife is female and over 40 years of age (Bogossian, et al., 2011). Additionally, the midwifery workforce is aging, not getting younger, with almost two in every five of all employed midwives aged 50 or older (AIHW, 2012). See Table 7.

Table 7: Demographics of employed midwives in Australia 2011 (AIHW, 2012)

Demographics of employed midwives 2011			
	Registered midwives only	Dual registered working as a midwife	All midwives
Male proportion (%)	0.4	0.9	0.8
Average age (years)	38.2	46.6	45.7
Proportion aged 55+ (%)	8.5	24.8	23.0

Education, age and gender have been found to correlate with ICT uptake and confidence (Broos, 2005; Hüsing & Selhofer, 2002; Neves, Amaro & Fonseca, 2013). Participants made reference to this aging midwifery workforce, and implied that in general the older the midwife, the less computer literate they were. Eley et al. (2009, p. 5) in their study of the Australian nursing workforce, found that “although significant, the influences of age were relatively small, with little change to mean values across age groups”. Other reports of an aging midwifery workforce being a barrier to ICT appear in the literature

(Brumini, et al., 2005; Dillon, et al., 2005; Yu & Comensoli, 2004), with a lack of computer skills also identified in this group. In contrast, Ridgway et al (2011) in their survey of 606 child health nurses (all with midwifery qualifications) in Victoria, Australia, found that in this workforce, the majority, 53 percent who were over 50 years, self-identified as confident in the use of ICT. The reported reason for this was that over 80 percent of respondents had received training in the use of computers or electronic resources, compared with only 30 percent of Australian nurses overall (Eley, et al., 2008b).

Participants in this research also indicated that age was a factor in the successful use of computers for perinatal data entry. Participants who perceived themselves to be computer literate also described a better adaption to the computerisation of perinatal data. They felt that other midwives, who participants described as computer illiterate, did not adapt as well. Personal perceptions of computer literacy may be accurate or inaccurate, and were not measured as part of this research. Regardless of the perception, **adapting** to using computer systems requires confidence with technology (Gosling, Westbrook & Spencer, 2004) as well as competence (Kunz, 2010). Gender differences in relation to anxiety have been found to relate to computer literacy or experience. In a study on 1058 participants with an average age of 47 years, anxiety in female users was not found to decrease with experience, and it took longer for them to become more positive about the use of computers (Broos, 2005). Recognition in the literature of lower numbers of women accessing ICT than men are thought to relate to the design of systems occurring for male-dominated working environments (Huyer & Mitter, 2003; Vodanovich, Urquhart & Shakir, 2010). With women making up more than 99 percent

of practicing midwives within Australia, seen in Table 7 (AIHW, 2012), such findings may also have an impact on perceptions of computer literacy and ability to adapt to new systems.

**Adapting** informed the core category of **engagement**. Engaging with computerisation of perinatal data equates to **adapting** to the system in use, which here has been presented as the perception of some participants in this research. If a user perceives that they are computer literate and this in turn aids in their **adapting** to the computerised system for perinatal data entry, they are moving towards successfully engaging with the process.

### Just another job to do

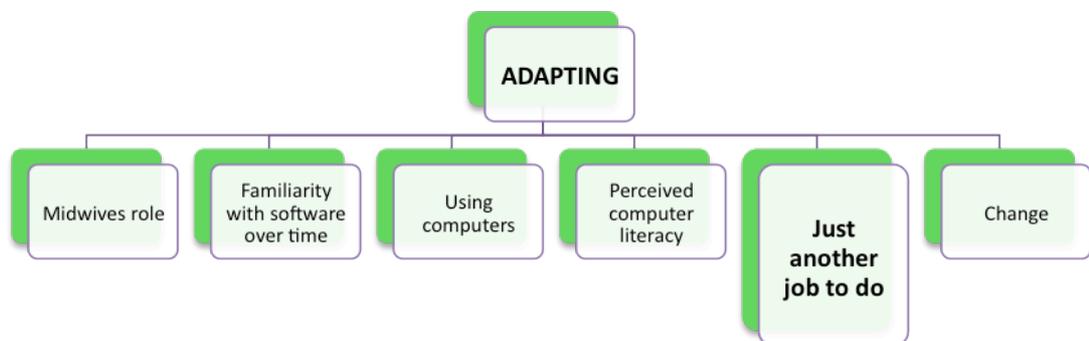


Figure 67: Just another job to do

The findings from this research identified resignation in some participants to the task of entering perinatal data, rather than indicating an understanding of, or a value for, the process. As a result, they expressed no awareness of the benefits of computerised perinatal data collection, and instead described it as just another of many jobs that they had to do. Participants who expressed this type of attitude also indicated that they

placed low priority on the task and said it increased the likelihood of it being passed on to other staff to complete. In doing so, time taken to enter the perinatal data by someone not familiar with the mother and baby increased. Additionally, passing the data entry to another person was identified as a contributing factor to the feelings of reduced responsibility.

Midwifery, like nursing, makes use of team approaches, and often experiences variations in the skill mix of professionals on each shift in the provision of care (Dubois & Singh, 2009). In these current times of tight fiscal environments and austerity in healthcare, within the midwifery environment, non midwifery staff may be utilised for general nursing care of midwifery clients and may be assigned lower priority ‘tasks’ that are not considered as needing midwifery skill. Participants of this research unanimously agreed that entering perinatal data required clinical midwifery skill, and although some argued for administrative data entry in this domain, this was not occurring in any unit that any of the participants currently worked in. The ‘task’ of perinatal data entry was not communicated as being handed to non-midwifery staff, despite the identification of it as having a low priority and being seen by some as just another job to do. This finding is dichotomous in that, agreeing clinical skill was needed could indicate some value for the accuracy of the data entered, and indicates an understanding regarding the usefulness of the process for midwifery practice. As early as 1990, Maresh (1990) was claiming that data should be entered by midwives themselves as they, having been part of the birth, are the ones most likely to know the correct data requirements. Other research has identified that overburdened health workers may view ICT as just another work requirement (Management Sciences for

Health, 2011) and a lack of education and support, both organisational and technical, may only work to cement this belief.

## Change

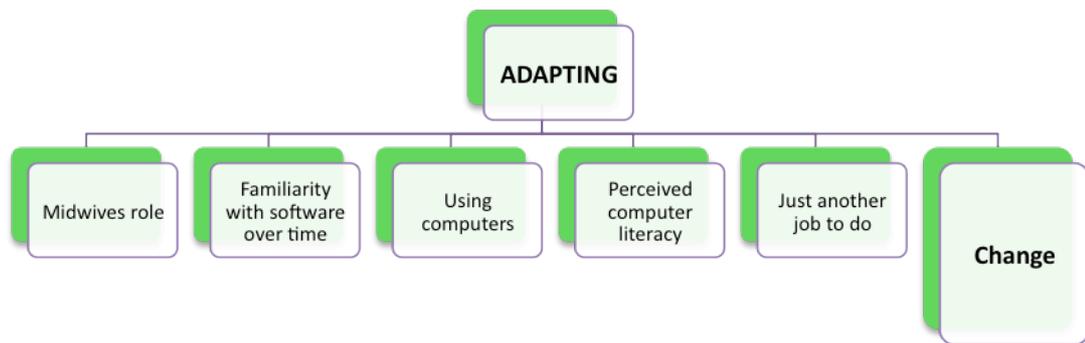


Figure 68: Change

Within the healthcare sector globally, change based on implementation of ICT is taking place rapidly (Marchesoni, Lindberg & Axelsson, 2012). Midwives can either recognise and embrace the advantages of the changes ICT brings, such as saving paper and easier portability of electronic information or they can resist such change and see only that the computer is duplicating what they consider to be good paper records or the inability for such change to fit with current workflow. Without doubt, ICT improves the ability to access and manipulate health information (Kaplan & Harris-Salamone, 2009) once it is available in computerised format but that does not necessarily mean collecting it fits with midwifery workflow. It also does not mean data is accurate.

The findings from this research suggest there is some resistance to change regarding ICT, and participants expressed this as being related to the age of midwives and the

length of time practising in the one locale. However, experienced midwives do need to be retained, as stated by Hennington, Janz and Poston:

It is critically important that system use not be a barrier to the retention of experienced staff that entered the healthcare profession prior to the introduction of IT as part of the day-to-day work experience. (2011, p. 1245)

Within the literature it is reported that healthcare staff are tired of being subjected to so much change with scepticism about ICT stemming from previous experiences with other change (Marchesoni, et al., 2012). Midwives may feel no different.

Resistance to change was, in part, more related to online entry of perinatal data specifically rather than all ICT used in midwifery. This may be linked with identification of benefits that other systems provide and an inability of midwives to identify a benefit for entering perinatal data into the computer. Using pathology software provides users with results as soon as they are available, faster than are provided by phone or on paper. As such, visible and immediate benefits may encourage use of perinatal data software and a desire to be familiar with how to operate it successfully. If such benefit cannot be identified for entry of perinatal data into the computer, then the change may be resisted, passing on data entry to others and incomplete records occurring frequently. This in part, demonstrates the relationship between of **adapting** to the following element to be discussed, **perceived benefits**. As already stated, there exist complex inter-relationships between all nine elements in addition to their direct relationship with the core category, **engagement**. For the element **adapting**, a further relationship exists with the element **knowledge**. **Knowledge** is crucial for **engagement** as adaption to using computers for perinatal data

entry hinges on the knowledge (via professional development, an understanding of field definitions and support) that users have of the system and how to use it effectively. Further to this, it is proposed that improved **knowledge** via professional development for users of systems for perinatal data entry will lead to improved adaption to those systems and hence more successful **engagement**. Figure 69 shows these relationships.

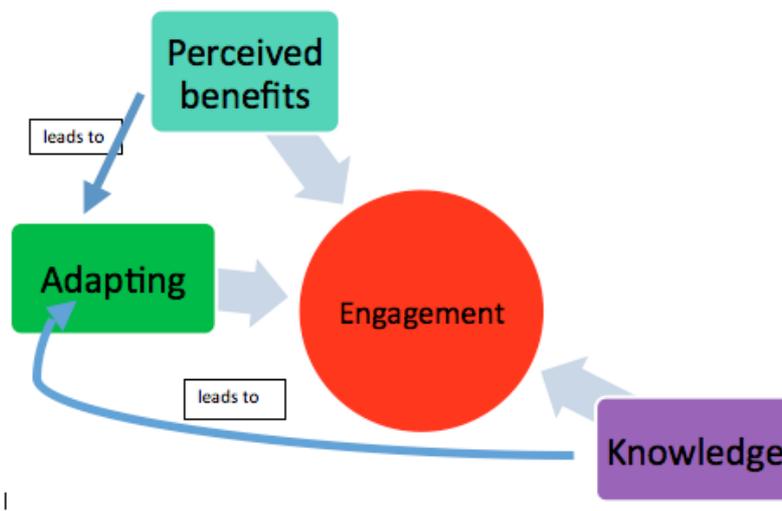


Figure 69: Relationships for the element adapting

The element **adapting**, informed by the themes discussed above, contributes to the core category of **engagement**. This is via the need for midwives to adapt in order to use the system they are provided for perinatal data entry and for engagement to occur. Research regarding approaches to ICT engagement for community health nurses found that for nurses to adapt to technology to support client care, individual and organisational barriers need close examination, adequate training and support are required and importantly, authentic involvement of users in the development and implementation

process is required (Courtney-Pratt, et al., 2012). The same may be said for midwives, with the findings of this research echoing these sentiments.

### Perceived benefits

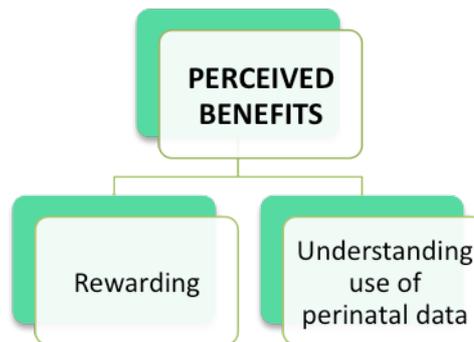


Figure 70: Element – perceived benefits

The key findings from the data in this element were:

- some participants perceived a benefit or reward in return for their effort of perinatal data entry
- rewards differed for participants
- understanding the use of perinatal data collection was not universal

Participants in this study identified perceiving benefits for entry of perinatal data within the broad themes of: 1) rewarding and 2) understanding the use of perinatal data. Such identification of a reward for the process of entering perinatal data, understanding the use of the data and a resulting awareness of the usefulness of the data as revealed in this research, suggests some understanding of how the process directly impacts upon the care of mothers and babies. Encouraging all midwives to beneficially engage with the process of perinatal data entry, and to invest more time and improved effort with the system, may result in improved completeness and accuracy of the records. Within the

theoretical literature, **The Theory of Beneficial Engagement** has some parallels to Self Determination Theory (SDT) (Ryan & Deci, 2000), which purports that individuals are motivated to engage in a task because of some inherent satisfaction gained from the task itself (Patall, et al., 2008; Patall, Sylvester & Han, 2014). However, according to SDT, a fundamental need underlying intrinsic motivation is autonomy (Deci, 1971). When conditions are controlling, such as in mandatory use systems, intrinsic motivation is diminished. Put simply, remove choice and intrinsic motivation is reduced. The findings of this research within the element of **perceived benefit** resonate with this theory. This was demonstrated by participants identifying personal benefits stemming from an intrinsic source. This suggests engagement with the process of entering perinatal data into the computer. It could be proposed that, even though midwives have no choice in whether they enter perinatal data online or not, by identifying benefits in return for their effort they regain some personal control over the mandatory process. The themes of rewarding and understanding the use of perinatal data will now be discussed in more detail.

## Rewarding

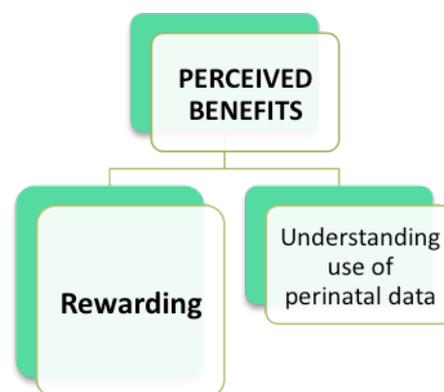


Figure 71: Rewarding

Findings from this research identified that entering perinatal data was rewarding for some participants and therefore contributed to providing them with a perceived benefit. This is, they felt, a reward for the efforts they expended in the process of entering perinatal data online. This finding contributes new knowledge to the literature available in this area, and suggests the perceived benefits for users of ICT are essential to successful implementations when there are issues with ease of use (Ayatollahi, Bath & Goodacre, 2010; Kossman & Scheidenhelm, 2008; Vezyridis, Timmons & Wharrad, 2012). **The Theory of Beneficial Engagement** recognises this supposition (feelings of reward) as an attribute of midwives who beneficially engage with the process of entering perinatal data. Internationally, reward schemes are discussed within the literature with regard to the uptake of health ICT at an organisational level (Car, et al., 2008; Miller & Sim, 2004; Scott, et al., 2011). Recommendations resulting from a systematic review of the literature by Lluch, (2011) state that reward systems, such as incentive schemes to improve uptake of ICT and decrease resistance to it, should be aimed at focusing and influencing individual behaviour.

An example of such a scheme aimed at increasing adoption, focused on financial incentives to General Practitioners in the USA for meeting pre-defined goals of ICT uptake by 2014 (Gokhale, 2013). Such incentives within the scheme, were used to boost adoption of electronic health records (EHR), with policy makers believing financial support would assist practices to improve their quality of care via use of ICT (Gokhale, 2013). Payments were linked to meaningful use of ICT, in this case EHR, with reports of 52 percent of eligible hospitals attesting to meaningful use (Adler-Milstein, Furukawa, King & Ashish, 2013) while, as of 2012, only 12.2 percent of privately

operating physicians fell into this group (Wright, et al., 2013). Such reward schemes are extrinsic in nature and stem from organisational control or external forces from outside the unit. The literature around engagement by Thomas (2009) suggests that such external control via extrinsic reward existed in old business models, whereas more recently, engagement is seen to be driven by recognition of intrinsic rewards at a personal and unit level. Further to this, a review by Ward, et al., (2008) looking at attitudes of healthcare workers to IT, found many users were willing to overcome difficulties of implementation if they saw a long-term benefit. Such long-term benefit stems from an understanding of the system and how it can contribute to improving work practices in the long term. Other literature that discusses the use of incentives or rewards at an individual level (Cresswell & Sheikh, 2013) is related to incentives to adopt voluntary use systems, of which online perinatal data entry is not. Situating these findings within the theoretical literature, Ajzen's (1991) Theory of Planned Behaviour explains the intention to use a system via the constructs of user attitude and perceived behavioural control. Although criticism of the use of this theory in mandatory environments exists (Rawstorne, et al., 2000), engagement with systems such as that for online perinatal data entry relates to a positive user attitude to the system. This may stem from a perception of control over personal behaviour for system use based on the feeling of reward or benefit that the user recognises from the process.

The finding from this research, that a midwife may look forward to sitting down after a busy day to enter perinatal data, suggests that the midwife is receiving a benefit in exchange for the effort. So, for each midwife, finding what it is that offers them some reward (this could be intrinsic or extrinsic) in return for the effort of entering perinatal

data into a computer, may be the key to awareness of a **perceived benefit**. Other examples of perceived benefits provided by participants were; perceiving perinatal data to be a good auditing tool (the data enabled the midwife to check if certain mandatory tests were complete), improvements to written documentation for transcription, ability to see what the woman has undergone in previous births, and providing quick access to a summary of the woman's data. Definitions of success in the use of ICT systems relate to user satisfaction and are dependent on the point of view of the user. Success for the user may not be the same as that of an administrator (Despont-Gros, Mueller & Lovis, 2005). Therefore, it is posited that reward for one user will be different for another, and different again for users at differing levels such as clinicians versus administrators. It is the recognition of the benefit that such a reward has on the user that enhances their engagement with the system, giving them a personal or intrinsic reason to desire to fulfil the task as part of their role. This could be seen as an adaption to the mandate of perinatal data entry where, instead of the hierarchy exerting control over the midwife in requiring that they enter the data, the midwife takes on this control choosing to do so for reasons of personal or professional benefit.

## Understanding use of perinatal data

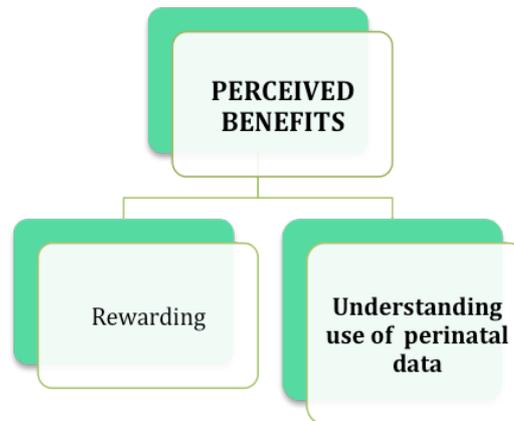


Figure 72: Understanding use of perinatal data

Understanding the use of a system, the data collected and its relevance and impact is seen as important in the use of ICT (McCullough, Walker, Lee, Prady & Small, 2013; Price Waterhouse Cooper, 2010). Furthermore, it is suggested that the perceived usefulness of a system is critical for its success or failure (Knaup, Garde & Haux, 2007). The findings from this research suggest that in general participants did not understand the use of perinatal data or how the data could have a positive effect on the women and babies in their care, or in their unit as a whole. This lack of understanding contributed to the difficulty experienced by some participants in being able to see the data as a useful tool, or relate the activity of entering perinatal data to their clinical practice. The findings from participants who did understand the use and usefulness of perinatal data contributed to **The Theory of Beneficial Engagement** as attributes of a beneficially engaged midwife.

Understanding use of perinatal data relates to users being able to describe trust in the data they utilise from the collection as being accurate. Inaccurate data was not

considered useful. An example of a participant communicating such benefit is seen here when describing how research is informed by data:

*“Because having worked in research based midwifery for many years, I can see how accurate research has a positive impact on changing practice” P13.*

This narrative suggests a willingness to embrace technological entry of perinatal data in order to ensure accuracy and completeness. However, the literature on electronic documentation reports that implementation teams holding such beliefs assume that users share an understanding of the system and its benefits to practice; a shared understanding that may not actually be present (McLane, 2005). McLane’s research identified a need for education regarding the usefulness in order to promote understanding. This finding resonates with **The Theory of Beneficial Engagement** and the optimisation of the element **perceived benefit**. Optimising this element requires enabling midwife-users to develop a thorough understanding of the use of perinatal data possibly through education. The theory emerging from this research purports that this may lead to beneficial engagement.

It is proposed that when a person collects data as part of their normal job function and for their personal use, they are aware of the importance of the data and its immediate usefulness (Kerr & Norris, 2008). In contrast, when users are instructed to collect data by personnel at a higher level (directed), the relevance to the user is often low (Kerr & Norris, 2008). Such directives to collect perinatal data and enter it into computers are given to midwives in Queensland. Professional development regarding the benefits to practice that perinatal data entry can provide to both midwives and mothers and babies, may lead to a clearer understanding of the system, thus sharing the importance with

those entering the data. This highlights the relationship between the elements **perceived benefit** and **knowledge**. It may also lead to greater understanding of its usefulness, which in turn could flow on at an individual level to more effort in accuracy and completeness of records. This in turn contributes to the core category of **engagement**.

The findings within this element resonate with Benner's theory of Novice to Expert (Benner, 2001), which was introduced in Chapter 2. Benner's theory defines five skill levels the ICT user moves through: novice, advanced beginner, competent, proficient, expert. The expert or proficient user is described as having realised that the system has a purpose and, in doing so, has developed a deep understanding of the functions and how they directly support clinical care (Turner, 2010). Users from Turner's (2010) research are seen to be the most effective in promoting the system within their work environment. This parallels findings from this research which showed that engaged participants assisted others in using the system. Similarly, findings from other research suggest that employees motivated by intrinsic rewards become marketers for their organization building a high engagement culture (Thomas, 2009).

Together the themes rewarding and understanding the use of perinatal data inform the element **perceived benefits** with the discussed findings communicated by participants attributes of engagement. Perceiving benefits in return for the process of entering perinatal data suggests that participants are beneficially engaging with the process of perinatal data entry as defined for this research. Relationships exist between the element **perceived benefit** and both **accountability** and **adapting** as discussed above and shown in Figure 73. Further relationships are present between this element and **workload** as

prioritising perinatal data entry may be one result of identifying a reward by the user of the system. This will be discussed in the next element to be presented, **workload**.

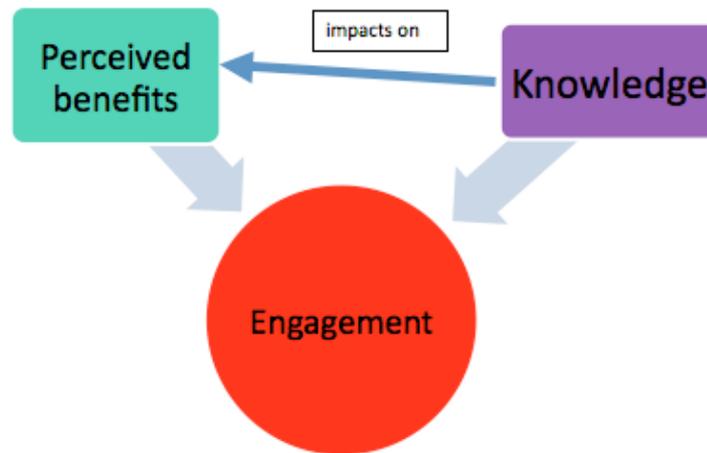


Figure 73: Relationships for the element perceived benefits

## Workload

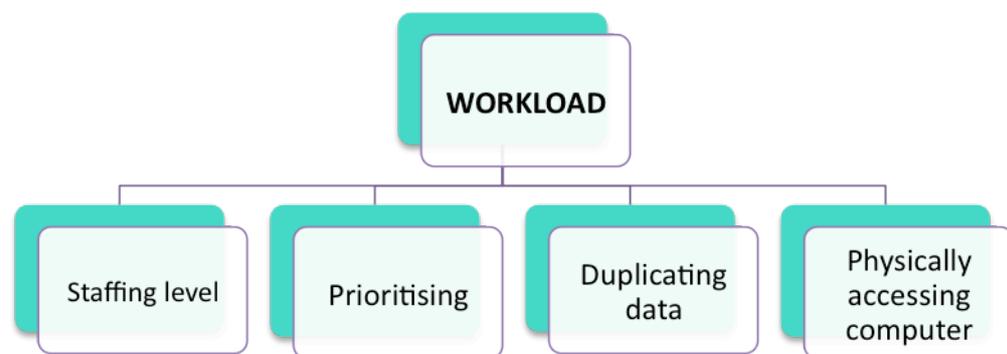


Figure 74: Element – workload

Workload within midwifery has been found to be increasing (Larsson, et al., 2009) in a response to tight fiscal management and an era of increasing costs of healthcare where midwives are expected to work smarter not harder (Taylor, 2006). The participants in this research experienced perinatal data entry into a computer as another of the many

jobs they had to fit into their busy day. The element **workload** emerged as a concern identified by participants. The key findings from the data of this element were:

- time for perinatal data entry is not factored into daily workloads
- paper records remain the priority in documentation
- duplication of data occurs across multiple paper and computers systems
- participants had difficulty accessing computers when the time for perinatal data presented itself

Their ability to manage their workload was influenced by the themes staffing level, prioritising, duplicating data, and physically accessing a computer. Each of these will now be discussed.

### Staffing level

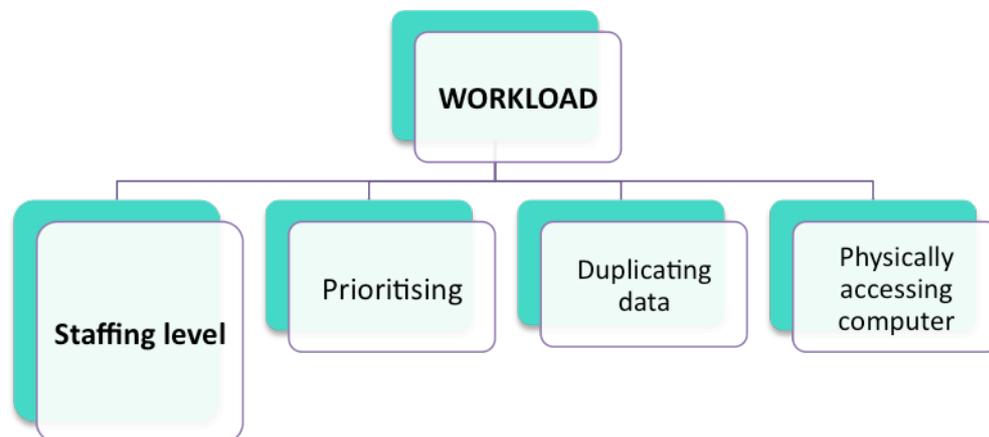


Figure 75: Staffing level

Commonly reported but often overlooked reasons for dissatisfaction in midwifery are; inadequate working conditions relating to shift schedules, hours, staff shortages, stress and overload (Mollart, et al., 2013; Walpole, 2011). This research found ‘finding the

time' was difficult when the staffing level was inadequate. This was particularly the case when more tasks, such as the entry of perinatal data into the computer, were said to be required as part of what participants described as a midwife's already busy daily work. Tomic and Tomic (2010, p. 476) report that "It is likely that nurses with a higher perceived workload will not be fully concentrated and deeply engrossed in the work (absorption)". These authors found, although reporting on nursing findings, that the principles relate to midwifery, found a higher degree of perceived workload may result in decreased vigour and energy and therefore decreased engagement. In relation to computer entry of perinatal data, some participants of this research communicated being able to find the time to enter the data in their already busy day, whether that was on the same shift or another day. This relates to the theme prioritising - the priority the midwife places on entering perinatal data, the next contributing theme to be discussed.

## Prioritising

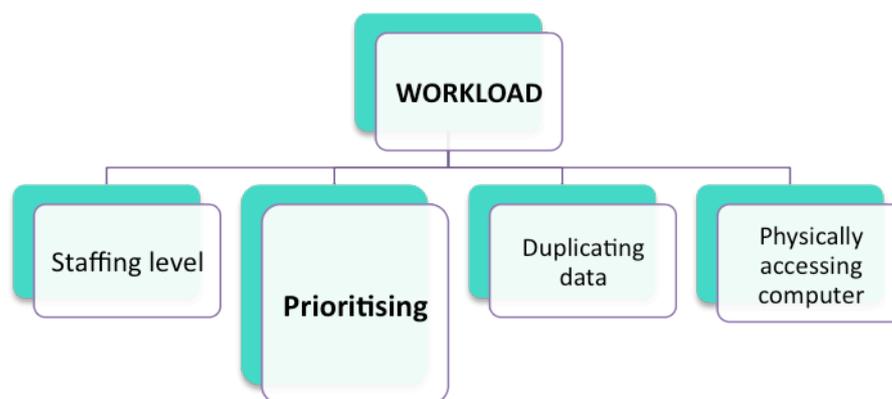


Figure 76: Prioritising

Participants who communicated attributes of elements suggesting they were beneficially engaged with perinatal data reported that they would move such data entry 'up the

chain' from other seemingly less important tasks. Kohle-Ersher et al. (2012) found documentation that using ICT by healthcare workers is not perceived as a high priority when compared to inpatient care tasks. For some participants in this research, the low priority placed on perinatal data entry equates to being unable to find the time and so passing that on to another midwife or the next shift, rather than other tasks being passed on. A contributing factor to this may be the need of some midwives to be seen as having done all their work, but seeing 'midwifery work' as 'hands on' client care rather than use of a computer. Focus groups with midwives in the UK determined that delegating to other health care workers the more mundane tasks of the midwifery role such as bed making, baby bathing and assisting with breast feeding, was accepted practice, but was seen as a lost opportunity to build rapport with the woman (Davies & Iredale, 2006). These same midwives feared role erosion if too many aspects of the care were delegated (Davies & Iredale, 2006). It may be that holding on to the role of perinatal data entry and the belief that it should be done by clinicians equates to this concept, and closely relates to how each midwife sees their role as was described under the element **adapting**.

## Duplicating data

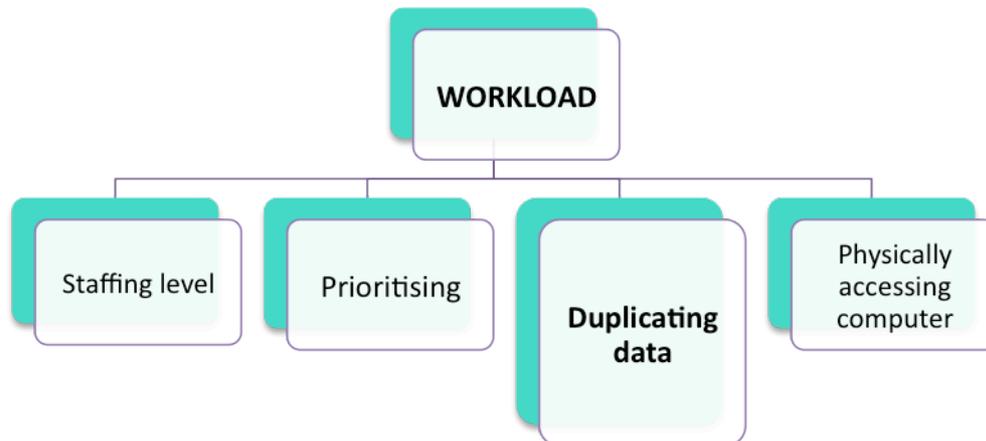


Figure 77: Duplicating data

Participants indicated that midwifery workloads are affected by the increased time taken to enter duplicate data on paper and also into several different computer systems. It is thought that duplication of data within organisations results from a lack of trust in original data quality (Kerr, Norris & Stockdale, 2008). This lack of trust in data quality may contribute to maternity units creating duplicate local databases for storing data, as was identified in this research. Fawdry, Bewley, Cumming and Perry (2011), suggest in their discussion about midwives re-entry of data into many databases thus duplicating information, as well as the time taken to enter the same data more than once, that this occurs due to a lack of interoperability of systems or standardised language and coding between systems. In findings from the large Australian study of nurses and midwives undertaken for the Australian Nursing Federation (Hegney, et al., 2007), frustration was expressed that use of information technology had failed to reduce errors in data, while many reported an increase in duplication of data. This was reported as resulting from a

lack of data entry at point of care, and systems that were not fit for purpose. Both are similar to findings from this research and can be seen in discourse throughout the literature (Ridgway, et al., 2011).

Contributing to this is the lack of understanding by participants of the significance of perinatal data, and the statistics available to each unit at both a macro and micro level for use from the collection. This was also a finding of this research. Utilisation of the statistics provided by the central perinatal data collection unit could provide the information duplicated into these local databases. However, if there is no trust in the quality of the data or the data takes so long to be available to the unit requesting it, this duplication will continue, thus adding to the workload of already frustrated midwives. Without education on the functions of the perinatal data collection, methods for retrieving statistics at a local level from it and therefore reduction of the duplication of data entry, midwives will continue to see perinatal data as another job of entering the same data increasing their already busy **workload**. This does not enhance **engagement** with it, but rather increases the barriers to successful use of the computer for perinatal data.

## Physically accessing a computer

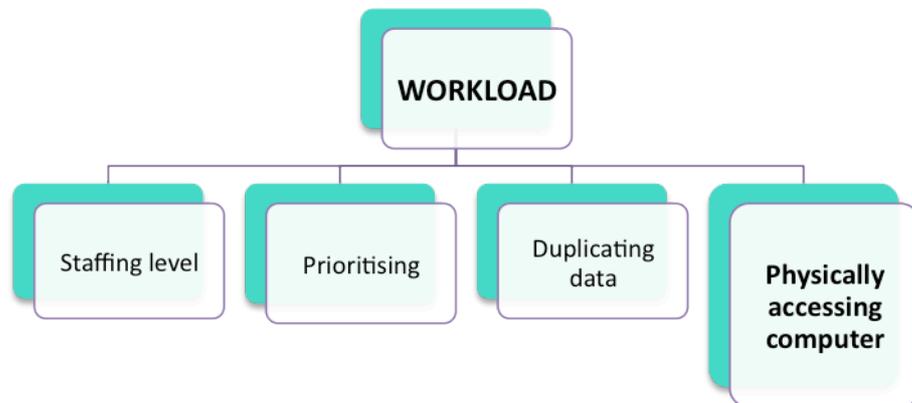


Figure 78: Physically accessing a computer

This research found that accessing computers for perinatal data entry was fraught with difficulty. This was mainly due to competition with other healthcare staff for desktop computers, particularly during business hours. Such difficulties have been consistently reported in the literature as a barrier to success in ICT uptake (Carlson, et al., 2010; Irinoye, Ayandiran & Mtshali, 2013; Timmons, 2003; Ward, et al., 2008). Interruptions to workflow occur as a result of no access, with midwives required to make time later when a computer was free. Such interruptions may lead midwives to forget information gathered at the point of care prior to locating an available computer in which to enter the data (Ash, Berg & Coiera, 2004). The fact that such findings are repeatedly reported in the literature suggests a long-term inadequate supply of computer equipment. With the enormous cost of implementation of new ICT systems (Car, et al., 2008; Kaplan & Harris-Salamone, 2009; Lluch, 2011), success of systems is paramount. Failure of ICT implementation is reported to have a high incidence of occurrence and equates to financial losses (Rahimi, et al., 2009). Although barriers to ICT adoption appear

difficult to address (Standing & Cripps, 2013), the provision of adequate computers for access by staff, so that when they have the time in their workflow they can use them, could stem negativity and potential failures of implementation. Midwives need the necessary equipment to do their job in a timely manner.

Workload has relationships with other elements explicated in **The Theory of Beneficial Engagement**. Data in this element directly relates to the element **shifting focus** via additional time spent entering data into multiple places, both on paper and into other computer systems, increasing time away from the hands on care of the mother and baby as well as the attention given to them when entering data at the point of care. Inadequate staffing levels, lower priority placed on perinatal data entry by midwives and difficulty physically accessing a computer, all shift the focus of the midwife from care of the mother and baby. It is proposed that if the element **workload** is optimised, then midwives would have more time for hands on care of the mother and baby and therefore may be more amenable to data entry at the point of care. This relationship is shown in Figure 79.

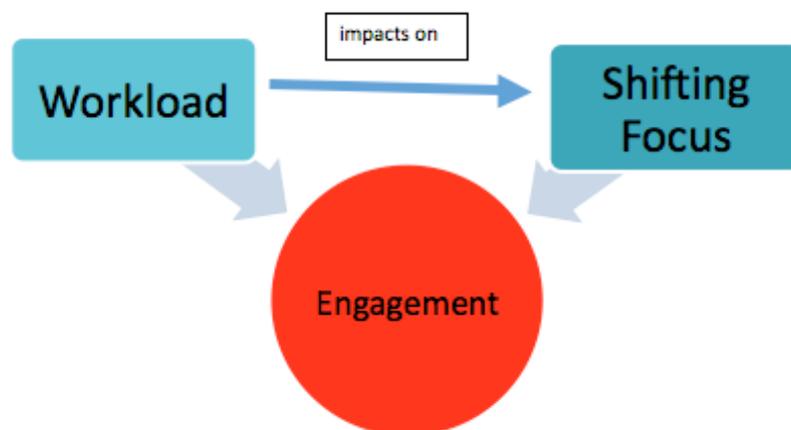


Figure 79: Relationship for the element workload

The element **workload** is informed by the themes discussed above in relation to the extant literature contributing to the core category of **engagement**. As discussed, midwives workload is high and for the most part perinatal data entry is taking a lower priority than hands-on client care. Frustration with not being able to find an available computer and then duplicating the data entered from the medical record or other computer systems, suggests the environment for **engagement** is reduced. It is clear that addressing these barriers is essential to ensure the path for midwives to engage with the process of perinatal data entry.

### Shifting focus

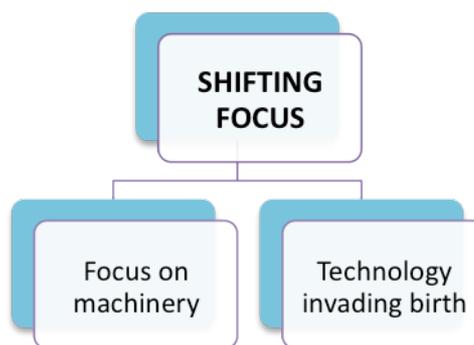


Figure 80: Element – Shifting focus

Primarily, participants in this research expressed a focus on the care of mothers and babies as the central feature of their profession. They were concerned about the change that ICT brings to that focus. Terms like “*primal*”, “*emotional*”, “*spiritual*”, “*women-centred*” and “*low-risk*” were all used by participants to describe how they feel about labouring women and their role as midwives being a part of that process. This element has a relationship with the theme midwives role informing the element **adapting**, which was presented earlier. Midwives have been historically trained and more recently

educated, in a particular way, perceiving themselves as having a specific role. Midwifery education focuses on the holistic care of the women, with midwifery research focusing on sample groups of low risk women (Cragin & Kennedy, 2006). Women who move out of this normal range, into a level termed high risk, are more the focus of obstetrics. There is no argument about the fact that care of both the low and high risk woman forms part of the modern midwifery role in healthcare institutions, and that Australia has some of the lowest rates of mortality and morbidity worldwide (Walker, 2011). However, literature reports that there is an increase in midwives dissatisfaction with the medicalisation of childbirth as they perceive it reduces their autonomy in their care of the mother and baby (Baker, et al., 2007; Gerrish, et al., 2006; Johanson, Newburn, & Macfarlane, 2002). Introduction of further ‘machinery’, such as computers, to record perinatal data adds to the increasing technology involved in the midwife’s role. Sitting in the corner of the birthing room recording perinatal data onto a paper collection form, as was communicated as past practice by participants, is no longer an option for midwives. Instead, delays in recording that data can result unless computer equipment is introduced into the birth suite or the midwife leaves the room. A resulting **shifting focus** in the care of the mother and baby was communicated by participants in reaction to this, affecting their engagement with perinatal data.

The key findings from the data of the element **shifting focus** were:

- computerised perinatal data entry led to a physical shift in focus from the mother to the computer screen
- computers needed to be dealt with as a third entity in a consultation when entering data at point of care

- some participants found computers increasing the amount of technology in the birth suite negatively impacting on the primal nature of the birth process

The element **shifting focus** is informed by the themes focus on machinery and technology invading birth, which will now be further discussed.

### Focus on machinery

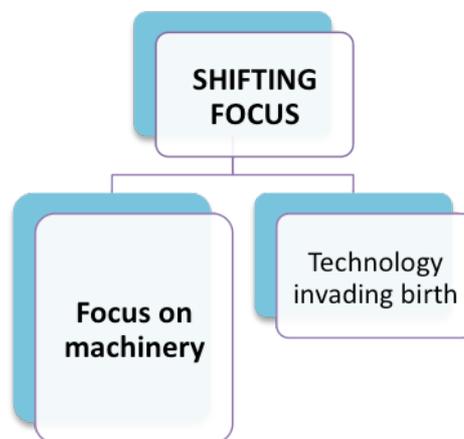


Figure 81: Focus on machinery

Use of computers in antenatal clinics for point of care perinatal data entry was reported by some participants. Focus on the computer as a separate entity, as opposed to the more traditional focus on the mother when interviewing, was communicated by participants as a concern when undertaking such data entry. The participants felt that they focused on the computer rather than the mother. This finding concurs with recent literature in this area; e.g. a study of health care workers found that two-thirds of respondents reported that using a computer interface, in this case an EHR, interfered with eye contact with patients. In addition, 40 percent also said that it interfered with communication during the consultation (Makam et al., 2013). Qualitative research documenting interviews of inpatients about their perceptions of the use of EHRs also

reported that they felt the computer was a third entity that distracted the healthcare worker from being there with the admitted client (Kerr, et al., 2008; Strauss, 2013). Similarly, Kohle-Ersher et al., (2012) found that 10 percent of admitted clients found staff using in-room computers for charting was upsetting, as they have their back to the client while others found the light, noise of tapping keys and alert noises disturbing. In contrast to this, computer tablets were found to be beneficial as they allow users to be able to maintain eye-contact with the client while recording admission data (Carlson, et al., 2010).

The element **Shifting focus** is informed by the theme focus on machinery. Data entry into a computer potentially adds to the role confusion participants feel when not fulfilling what they consider their primary function of hands-on caring for the mother and baby. This concurs with similar findings within the literature (Baker, et al., 2007; Gerrish, et al., 2006). Should midwives feel that entering perinatal data into the computer impedes their ability to provide adequate hands on care, they may engage less with the system, thus reducing the priority of the task during their shift. Participants communicating willingness to overcome such barriers and engage with perinatal data entry may instead focus on other benefits of perinatal data entry. In doing so, they perceive the task as an important part of their role, and may assist mothers to also understand this and see the benefit of some shift in focus.

## Technology invading birth

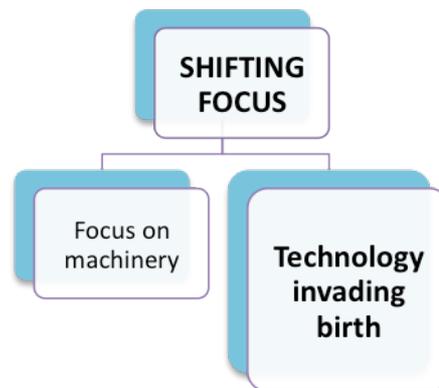


Figure 82: Technology invading birth

It is expected that, as maternity care moves further into the 21<sup>st</sup> century, medical innovation increases dependence on, and use of, technology; the medicalisation of childbirth (Foureur, et al., 2010; Hodnett, Edwards & Walsh, 2005). As early as 1990, Paneth (1990) questioned if the results achieved by investment in technology are worth and the cost, both human and financial, and of its presence where it may not be needed. Jolles, Brown and King (2012, p. 316) state that, “Decades of high-quality research have demonstrated iatrogenic harm involved with the overuse of technology in the physiologic birth process”. This assertion is validated by Cochrane systematic reviews in this area (Alfirevic, Devane & Gyte, 2013; Devane, Lalor, Daly, McGuire & Smith, 2012). Further to this, research investigating increasing technology in the birth suite particularly, found that midwives faced new dilemmas in dealing with it, and had difficulty determining when technology is a help and when it is not needed (Blaaka & Schaurer, 2008; Hyde & Roche-Reid, 2004). Midwives in contemporary practice must deal with new technology in the birth suite but somehow not allow it to take their focus off the mother. The technologies referred to here, such as cardiotocographic (CTG) machines that provide continuous foetal monitoring, are already used in the birth

process. Further to this, it is reported that stress is experienced as a result of practising midwifery in a physical environment embedded with medical technology (Hammond, Foureur, Homer & Davis, 2013).

Findings from this research into entering perinatal data into a computer have some similarity with this literature regarding those midwives who seem to dislike the idea of the presence of technology in the birth suite, and the resulting effect they believe this could have on the primal process of birthing. Increases in technology in birth as described above, already have an effect on the birthing environment (Foureur, et al., 2010; Kornelson, 2005), and increasing this with the possibility of computers either desktop, hand-held or mobile in the birth suite, was considered as concerning by participants. They were concerned it may impact negatively on the process. News of digital hospitals being built in Queensland including one in Hervey Bay (Chapman, 2012) and the new Gold Coast University Hospital (Stanley, 2013), suggests it is only a matter of time until such ICT integration becomes reality. Development and testing of ICT tools are currently in progress. These include tools such as a handheld interactive electronic maternity record (Homer, et al., 2010) to be used as a cooperative record between mothers and their range of healthcare providers in pregnancy connecting through the EHR. In contrast, some participants embraced the idea of further ICT integration, seeing the advantages that it could bring into midwifery practice. Such diversion of feelings about technology in maternity units may stem from past experiences with computers (Baker, et al., 2007; Hegney, et al., 2007; Shoham & Gonen, 2008). Significant differences were identified by Kaya (2010) regarding nurses' attitudes to using computers based on their previous experience with computers.

Midwifery means being ‘with women’ not ‘with computers’, but a balance between the two is a looming challenge.

Relationships exist between the element **shifting focus** and the core category **engagement** as well as with the element **perceived benefit**. The shifting of the midwife’s focus from the woman to the computer interrupts the episode of care and satisfaction of that care experienced by the midwife and the woman. This in turn increases the midwife’s difficulty of perceiving a benefit for perinatal data entry. It is proposed that by improving the midwife’s management of focus while using a computer interface during point of care perinatal data entry will negate this relationship. This may alleviate the negative influence shifting focus has on the experience of perinatal data entry. This is shown in Figure 83.

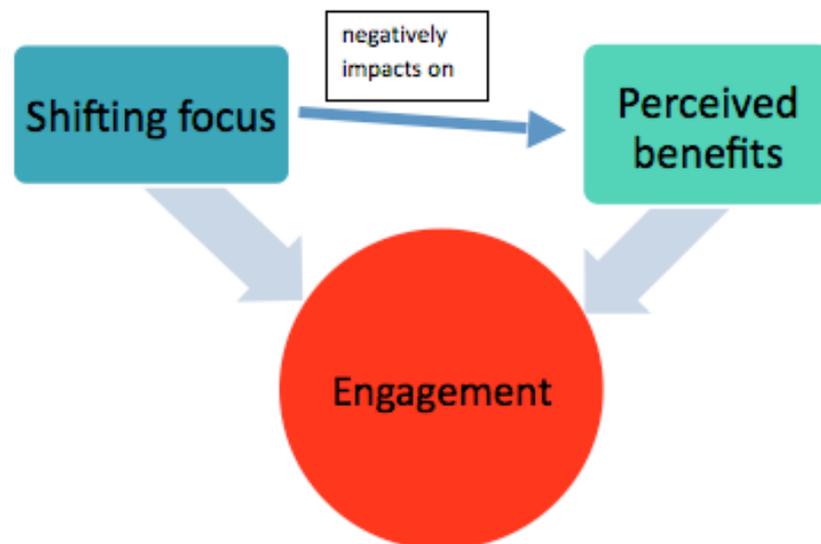


Figure 83: Relationship for the element shifting focus

## Software

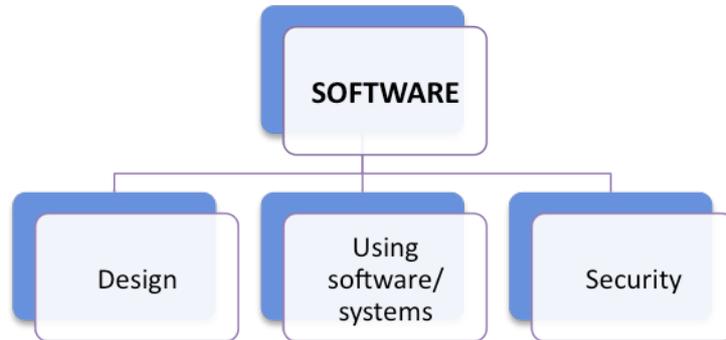


Figure 84: Element – Software

Participants reported difficulty in using the different software systems for perinatal data entry. These difficulties stemmed from perceived poor design and related poor usability, or participants questioning why some frustrating incidents did or did not automatically occur within their particular system. The themes of design, using software/systems and security together informed this element, **software**.

## Design

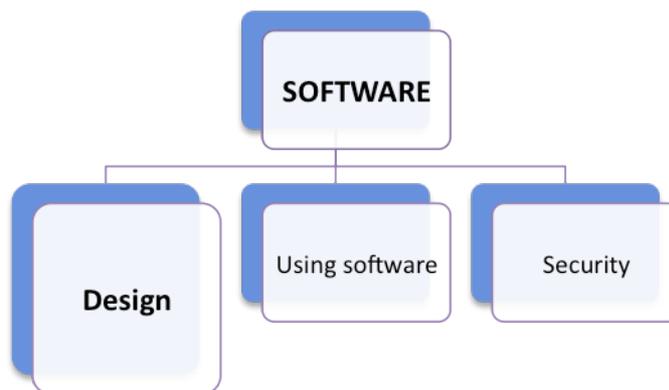


Figure 85: Design

Participants felt strongly about the need for clinicians to be involved in the design phase of perinatal data entry systems that they will use. Such an approach places the user at

the centre of the process, ensuring design of usable systems (Harms & Adams, 2008). This finding is consistent with other research in relation to ICT systems in healthcare. Authors often reported that innovations often fail in practice because of a failure to take into account the users' needs (Kaplan & Harris-Salamone, 2009; Pagliari, 2007; Sanderson, 2007). Many authors have identified this finding and recommend that nurses and midwives be involved in the design of systems they will ultimately use. Yet, currently this remains an issue that is not given appropriate priority in ICT development (Henwood & Hart, 2003; Lluch, 2011; Russ, et al., 2010; Urquhart, et al., 2009). Creswell et al., (2011) suggests that users are best placed to understand the intended context of system-use as opposed to contracted developers who lack important clinical insights. This 'blindness' results in a lack of understanding of potential consequences for end users, such as midwives. Other findings from a meta-analysis of qualitative literature on HIS implementation found that the major issues leading to inefficiencies in HIS implementations began with a lack of understanding by managers of users' needs, of design, or functionality. This equated to poor implementation of systems which do not support users' workflow (Rahimi, et al., 2009). The most significant system failures resulted from an absence of feedback from end users to developers during the development and implementation phases. Increased involvement of users in the ICT system design and implementation process is vital (Rahimi, et al., 2009). Recent research also supports assertions of poor design of ICT for nurses and associated failure to merge with nursing workflow (Cresswell, Bates & Sheikh, 2013; Irinoye, et al., 2013). Further research in the USA, regarding development of a national database for midwife-led births, found that of the 10,000 entries reviewed for the study, 42 percent underwent review, some for recurrent errors. This led to the identification of flaws in

the system design (Cheyney, et al., 2014). The recent Mid Staffordshire, National Health Service (NHS) public enquiry report (Francis, 2013), which uncovered extensive failure in the UK health system, made the recommendation that systems involved with data sharing must be designed by healthcare professionals in order to secure maximum engagement in ensuring accuracy, utility and relevance.

Various participants in this research identified a lack of knowledge regarding their ability to scroll down a drop-down box. Others communicated that the listing of items for selection within drop-down boxes was ordered differently to those that midwives were familiar with. This again contributed to a need for clinician involvement in design. Similar research findings by Hortman and Thompson (2005), assessing usability of healthcare systems for nurses, highlight the importance of knowing user needs, and what the user expects to see on the screen. Such gaps in knowledge are thought by management to stem from lack of training, when most often they are a clear function of users not being involved in the design process (Stevenson, Nilsson, Petersson & Johansson, 2010).

Failures in system design due to lack of involvement with clinical staff suggest a different approach is required if systems are going to be successful. Studies using action research and participatory research methodologies support this assertion (Burgess & Sargent, 2007; Courtney-Pratt, et al., 2012), demonstrating that involvement by clinicians during the ICT development and implementation phases improves successful use, adoption and acceptance. Midwives involved in participatory design of an ICT tool for professional communication in the UK facilitated successful implementation of the

tool with high levels of use by midwives (Brooks, Rospopa & Scott, 2004; Brooks & Scott, 2006). More recently, Hostgaard, Bertelsen, Petersen & Nohr, (2013) report on ways to involve end-users in HIT development, demonstrating success with their model in EHR development in Sweden. Such a plethora of literature in this area suggests that the healthcare industry needs to take heed and encourage users to be involved in system design or risk system implementation failure.

In this research, as reported in Chapter 4, post-implementation feedback from midwives using the Queensland Health software for perinatal data entry was reported to be used to make changes to that system (Pers comm. Ms Colleen Morris 21/5/12). However, the findings suggest that post-implementation feedback might not be enough, and that clinicians need to be involved in all developmental phases of the systems that they will eventually use. The fact that participants see an urgent need for clinician involvement in design reinforces the notion that midwives value accurate data and that they have a desire for improvement of the systems they use on a daily basis.

There are suggestions in the literature that utilisation of an ICT midwife, involved both in the design phase of a system as well as then acting as a driver at the clinical level during the implementation phase, is beneficial (Henwood & Hart, 2003; Jones, et al., 2006). Bridges (2007) communicates that nurses who move into ICT within healthcare never lose the professional understanding they have in terms of knowing what nurses need and how they think. Bridges (2007) believes that nurses go into ICT to help admitted clients through design of systems that can improve safety, quality and efficiency of client care, but do not get in the way of nursing work. This can also be

applied to midwives who move into ICT. Direct input by midwives from the beginning into the design of systems for perinatal data entry could alleviate some of the issues facing midwives as they struggle to integrate use of such systems into their workflow. Similar findings in the UK (Brooks, et al., 2004; Brooks & Scott, 2006) reinforce this, with the majority of midwives taught to use the system by their peers voluntarily after being involved in participatory design. Further to this, Turner (2010) suggests that minimal disruption to workflow acts to minimise perceptions of ICT as a stressor, leading to greater acceptance and improved use of systems. Turner (2010) describes how this could be achieved by involving clinicians in system design from the outset. As part of this research, this idea was also suggested by research participants who were in the role of perinatal data coordinator when stating;

*We've had some really motivated midwives who've come in and taken it (perinatal data) on board and driven it across (to) the other staff. P14*

## Using software

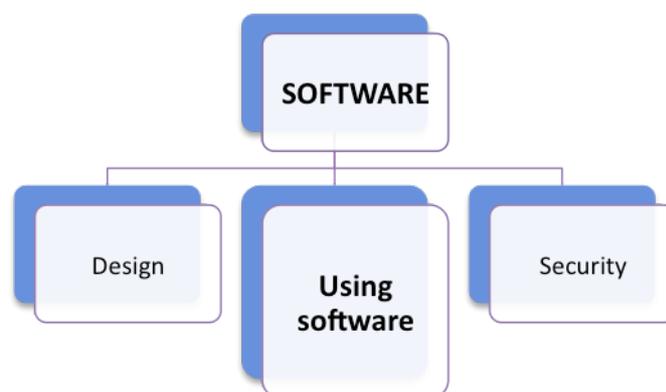


Figure 86: Using software

It is believed that healthcare has been slow to adopt ICT innovations (Thoroddsen, Ehnfors & Ehrenberg, 2012) and that historically the aging workforce of midwives has

brought resistance to the use of such innovations in the workplace (Darbyshire, 2004; Timmons, 2003). The findings from this research articulate difficulties in using software for perinatal data entry. Examples included the slow speed of the software in use, computer down time, and being 'locked out' after entering an incorrect password. All participants experienced some difficulties, but some spoke of ways to overcome such challenges. Overcoming the barriers to using software by some participants suggests their engagement with computerisation of perinatal data.

Challenges, such as password lockouts and other difficulties using systems, have been reported within the nursing and midwifery literature in relation to the use of ICT. Research by Darbyshire (2004) reported participants feeling frustration when using electronic documentation systems, reporting complaints with the slow speed of the computer and difficulty remembering passwords. These findings are replicated in other research (Kohle-Ersher, et al., 2012),

Workflow for midwives and the interrupted nature of midwifery work (Cooper, et al., 2004; Rivera & Karsh, 2010) results in midwives being called away from the computer. This contributes to frustration when they forgot to save entered data. Carlson et al. (2010) found that data entry was interrupted by the needs of admitted clients that supersede documentation needs. A lack of an automatic save function embedded in the system, and the need to re-enter data, did not increase participant satisfaction with using systems for perinatal data entry. It is proposed that when people use ICT, they expect it to function productively, efficiently and beneficially without pain agony and anxiety (Ash, et al., 2007; Norman, 1998). Chimbo, Gelderblom and de Villiers (2011) report

that, in contrast to children, adults learning new software use prior experience with systems to predict the actions of a new system. That is, predictability of a function within the system resonates with previous experience in the use of a similar system. Therefore, in ICT systems for use by adults, the presence of such predictability may assist in successful system use. Relating this to the findings of this research, participants' expectations of the system for perinatal data entry were not being met. This left participants feeling frustrated. One participant pleaded;

*Is it going to get any better? P2.*

## Security

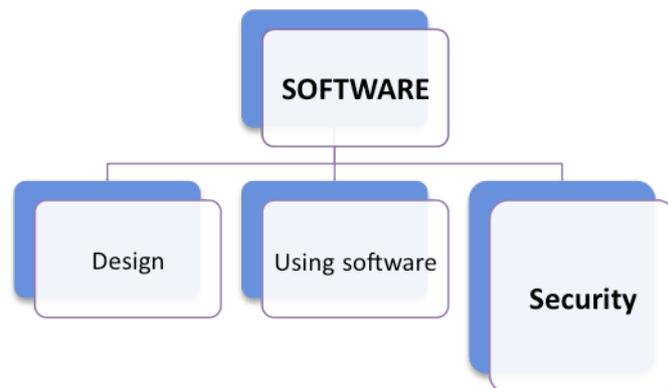


Figure 87: Security

Security of computer records via password access and encryption is regarded as being protected at a higher level than paper documentation (CellTrak, 2012). Contrary to this, other authors see the ease of transportability of electronic data as complicating the existing requirements for the privacy and care of data needed to be taken by healthcare professionals (Kerr & Norris, 2008). Healthcare workers have expressed concern about privacy when using computers in client rooms to enter documentation at point of care (Kohle-Ersher, et al., 2012). They are also concerned about confidentiality when

technical problems occur, or when visitors see desktop computers and potentially the information on screen (Wolf, Hartman, Larue & Arndt, 2007).

Participants in this research were concerned about confidential information being seen on computer screens by visitors or others. However, in contrast to this, the research also found some participants had limited understanding of why security of computerised perinatal data systems was so important. These participants did not appear to understand why requirements existed for regular changing of passwords for perinatal data software, particularly when other software they utilised never requested a password change. Some participants also seemed to lack an understanding of why perinatal data software shut down after a short period and required logging in again. Systems that operate on an intranet are private, accessible only to members of that network, such as members of one company, utilising software and protocols developed for the Internet (Oppliger, 2002). Alternatively, systems operating on the Internet are accessible to anyone who knows the Internet Protocol (IP) address, which is a unique set of numbers defining the computer's location (Oppliger, 2002). Both carry security risks. However, protection of an intranet, such as that used in Queensland Health, is increased via use of a firewall that acts to keep unwanted user out of the system (Oppliger, 2002).

The contributing themes of design, using software and security inform the element **software** and core category of **engagement**. It follows from this discussion that to encourage midwife users of perinatal data software to engage with the process requires first involving them in the design of that software to reduce the barriers that arise with use, which contribute to frustration rather than ease of use. Involvement in design also

sends the message that midwifery input is valued, thus creating feelings of system ownership (Burgess & Sargent, 2007; Carroll, 1997). Providing information on the security requirements of the system will help users understand why systems operate in a particular way, such as logging out once left idle for a short time and may further create a desire for midwives to protect the data of the women in their care. This element not only informs **engagement** but is also related to the elements **valuing** (already discussed above) and **adapting**. It is proposed that when midwives are involved in the design of software they will ultimately use, their motivation to adapt is increased. This may occur through altering the way midwives who are involved in design interpret their role as a midwife as well as increasing their motivation to adjust to the changes the introduction of technology for perinatal data entry brings to that role. Security issues emerging from data in the element **software** closely relate to the element **knowledge** as understanding how users are tracked through system login identification as well as awareness of healthcare organisation policy on password sharing may alter midwives' future behaviour. This is one of the areas of professional development, a theme of the element **knowledge**, that can assist midwives' **engagement** with perinatal data entry into a computer. These relationships can be seen in Figure 88.

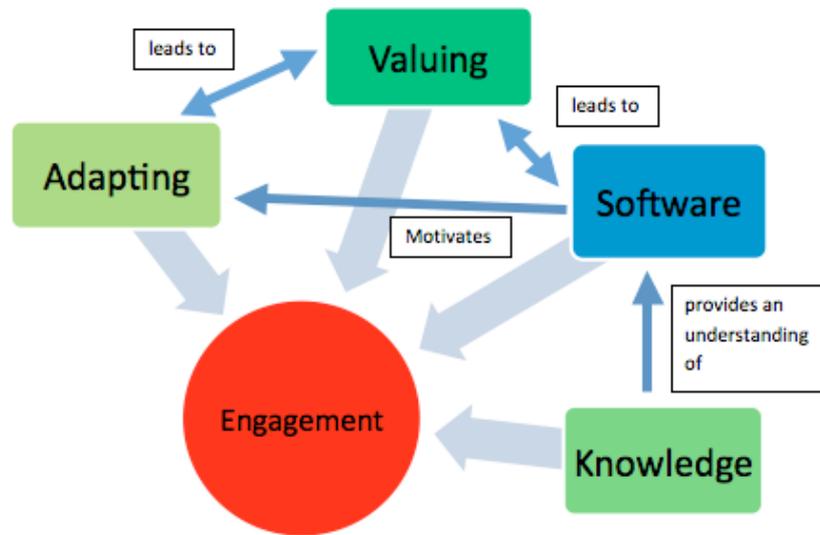


Figure 88: Relationships for the element software

Further discussion regarding the element **knowledge** will now be presented.

## Knowledge

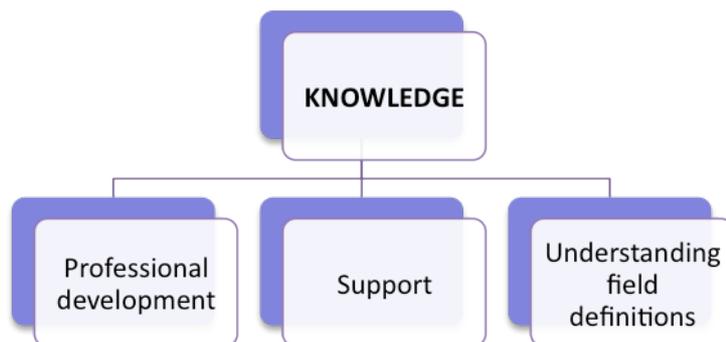


Figure 89: Knowledge

Being successful in entering accurate perinatal data involves a midwife having an understanding and having a familiarity with the computer system in use, having an

understanding of which data to enter in each field, as well as continuing support for using that system. Current research reiterates the need for continuing education in Health Informatics, previously discussed in Chapter 2, to address the needs of health professionals working with technology (Bernsten, 2013; Lin, Hsu & Yang, 2014). **Engagement** with perinatal data was informed by the element **knowledge**, which was subsequently informed via the themes of professional development, support, and understanding field definitions. The key findings of this element were:

- inconsistency in professional development of users of systems for perinatal data entry
- inconsistent understanding of field definitions and lack of knowledge of where to find information to aid that understanding
- no technical support for perinatal data systems

### Professional development

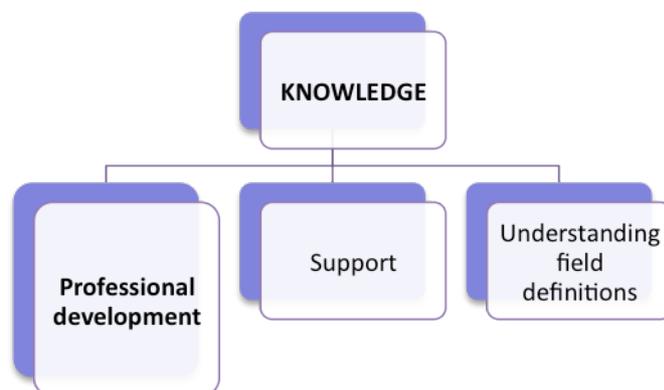


Figure 90: Professional development

This research found that variations in the length of training sessions, depth of information provided and an inability to use a dummy system prior to being required to enter live data, illustrate poor professional development in perinatal data entry.

Participants reported inconsistency in training between staff within units and in comparison to those from other units. This led to inconsistencies in the quality and accuracy of the perinatal data entered. As midwives work rotating shifts over 24 hours of each day, professional development needs to be provided to cover all shifts as well as those staff on leave, and for new staff commencing work after a system is implemented. Knowledge of, and access to training manuals specific to perinatal data software is required for midwives to be able to refer to information while entering perinatal data.

Australian research by Edirippulige et al. (2006) reported 71 percent of respondents considered the lack of education and training to be the main barrier to adopting ICT. Later work by some of these same authors (Eley et al., 2009) found that over 92 percent of over 4000 participant nurses and midwives agreed that learning about computers was essential for those working in today's health services. Lluch (2011) in an extensive review of the literature found that training was a key feature of successful adoption of ICT. Lluch (2011, p. 10) states "training is also understood as a means to promote user engagement". More recently Jansson, Vidarsson and Brash (2013) report that increasing ICT system education increased user satisfaction with some of the systems' abilities. It is asserted as a result of this current research that professional development for all staff, regardless of shifts and leave, is required, and this notion is replicated in the literature. This research adds to that body of literature which shows that consistency in the training provided is an essential requirement so that existing and new staff in each unit have a similar knowledge of the software.

## Support

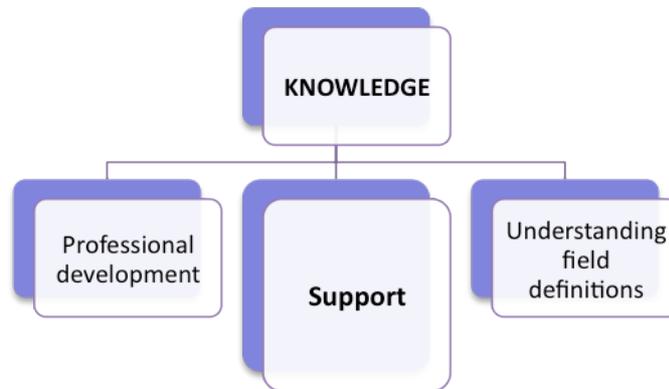


Figure 91: Support

Access to support, both technical for the computer and its operating system and for the perinatal data software specifically, is required for midwives to be able to perform the job of entering accurate perinatal data. The participants of this research identified that such support is generally unavailable across maternity units in Queensland. Technical support is required over all shifts, so that when the appropriate time arises for online perinatal data entry, any issues can be rectified immediately rather than left until later when support is possibly available, but the time needed for data entry has gone.

These findings add to the growing body of research suggesting that a lack of support via appropriate people and availability is widespread across healthcare institutions and healthcare professionals who use computerised systems in their practice (Baker, et al., 2007; Lluch, 2011; Rahimi, et al., 2008). It has been identified that implementation of computer systems requires a parallel level of technical support (Lluch, 2011; Rahimi, et al., 2008). Lack of access to effective round-the-clock ICT support was also identified by Baker et al. (2007) as a key element contributing to failure in ICT implementation.

Management support is also required to supply staff to unlock user passwords on all shifts seven days a week. Such organisational support is widely acknowledged as important in supporting effective use of ICT in healthcare (Cresswell & Sheikh, 2013; Lluch, 2011; Shachak, et al., 2013). The findings of this research suggest this is not occurring, consequently leaving users unable to have their ICT needs met at the time when a problem with entering perinatal data arises. Experienced users to assist with questions about perinatal data are also desirable across each shift, with access to training materials essential for all users. Without knowledge of the location of training material or even their existence, users were left with nowhere to go for information, and perceived there to be a lack of support. Training materials in hardcopy need to be located at the computers where perinatal data is entered and clear knowledge of how to find them online also needs to be given to all users to ensure they can succeed with entering perinatal data when that time presents itself. Without such support, engagement with the process of perinatal data entry into the computer will not be promoted, giving users an ‘opt out’ of undertaking the task, leading to a delay in the data entry and unmet expectations for the user.

## Understanding field definitions

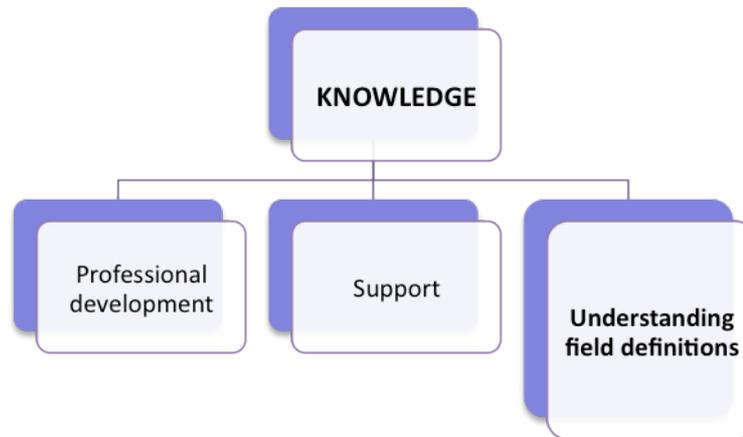


Figure 92: Understanding field definitions

A field definition is an outline of the expected information to be entered into a field within the software for perinatal data. An example of a field definition for the Online Perinatal Data Form used by Queensland Health can be seen in Appendix I. No measurement of understanding of field definition by midwives was undertaken in this research. However, when participants said that they asked other midwives to explain what was required in a particular field, they found that they received different answers and sometimes were given vague responses. This suggests that midwives understanding of the definitions for each field may not be consistent. Reported lack of training in perinatal data computer field data requirements and the lack of access to, or availability of, training materials when entering data, resulted in participants making personal judgements about the data that is required for each field. Such inconsistency in responses across fields leads to potential inaccuracy in data.

There is scant literature available in this area examining the understanding of the required data to be entered by midwives. However, material is published annually by

the Data Collections Unit of Queensland Health outlining the data requirements for each field (Data Collections Unit, 2012). Participants reported that this material is not easily accessible by midwives, or understood to be available in either paper or electronic form. This is a new contribution to this area of research. Research in the area of perinatal data collection via paper forms in Victoria, Australia, undertaken almost 20 years ago (Robertson, 1996, p. 396), resulted in providing explicit statements on “troublesome definitions”. The researcher states that although most data was collected reliably, there were problems with misunderstanding of definitions as well as under-reporting of complications. As additional items are added over time to the perinatal data collection, midwives entering data require further understanding of data definitions. Since its inception in 1986, the Queensland collection has increased from a single A4 sheet of data to a three-page A3 size data sheet, increasing the number of fields dramatically. Consistency between data entered into each field is imperative to accuracy in the collection.

Discussion of the above themes of professional development, support and understanding field definitions inform the element **knowledge** and contribute to the core category of **engagement**. If users engage with the process of entering perinatal data into the computer, they fulfil the definition of **engagement** and are involved with the process. This then aligns with their needs and expectations and results in entering the data with a focus on accuracy and in a timely manner. The discussion of these themes has shown that professional development and support are recommended in the literature for successful implementation of ICT in healthcare and that without them, users are confronted with barriers to engaging with perinatal data. Although it is old research in

relation to advances in technology, Carroll (1997) found that the midwife's role in implementation of an ICT system in Ireland was a linchpin for success in the entire healthcare service. Empowerment of users through training and resources such as support are found to be vital in midwifery systems' implementation (Carroll, 1997). Accurate knowledge of field definitions via training and access to written materials increases the accuracy of the data entered, and potentially the confidence of the midwife user in knowing which data to enter. This, in turn, may enhance their engagement. The element **knowledge**, as part of **The Theory of Beneficial Engagement** may be enhanced via an increase in ICT education for users on the system used, the perinatal data itself, including field definitions, and the availability of around-the-clock technical support. This could lead to improvements in end-user satisfaction with the system being used to enter perinatal data, and a resulting desire to engage with the system. In a review by Blavin, Ramos, Shah and Devers (2013) of lessons learned from EHR implementation, it was found that additional education and training were needed after the initial preparation. They also highlighted the need for availability of support to assist the staff as they learn, thus resulting in successful use of systems.

Additional to the clear relationship of this element with the core category of engagement, **knowledge** has relationships with the elements of **valuing**, **adapting**, **perceived benefits**, and **software**, which have already been discussed earlier in this chapter. Furthermore, many of the recommendations for from this research are centred around the professional development of midwives in effort to stimulate understanding of perinatal data and how it can benefit the mothers and babies they care for. This in

turn is proposed to encourage beneficial engagement with perinatal data entry. The relationships for the element knowledge are shown in Figure 93.

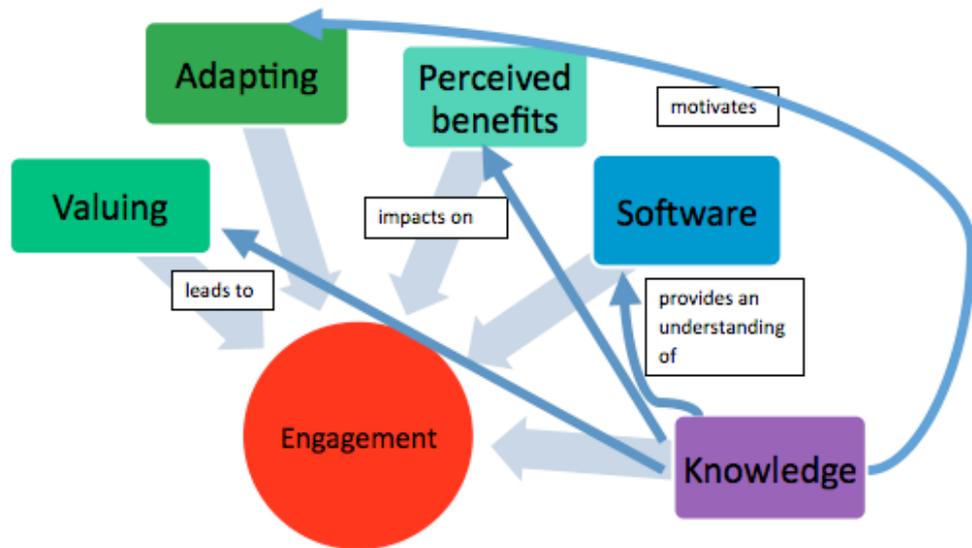


Figure 93: Relationships for the element knowledge

## Data entry

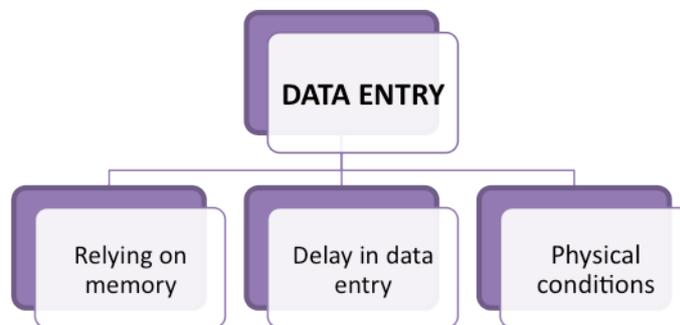


Figure 94: Element – Data entry

The process of perinatal data entry relies on the ability to use a computer, to type on a keyboard and manage the software provided. It is suggested that accuracy in data entry is compromised by any increase in time from the actual event to the recording of that event (Vawdrey, et al., 2007), as well as recording the same information in multiple

places. Research indicated that there is no doubt that benefits from electronic data records have transformed record keeping practices in midwifery (Wang, Hailey & Yu, 2011). However, this research has identified noteworthy issues with the process of utilising electronic sources for the recording of perinatal data. These are grounded in the data via the themes of **relying on memory**, **delay in data entry** and **physical conditions**. The key findings for this element were:

- reliance on memory when entering perinatal data with the assumption that the remembered data matches what has already been recorded elsewhere on paper
- lack of point of care computing contributing to a delay in data entry
- infection control issues relating to the physical nature of childbirth being ‘messy’ contributing to both delay in data entry and a reliance on memory

### **Relying on memory**

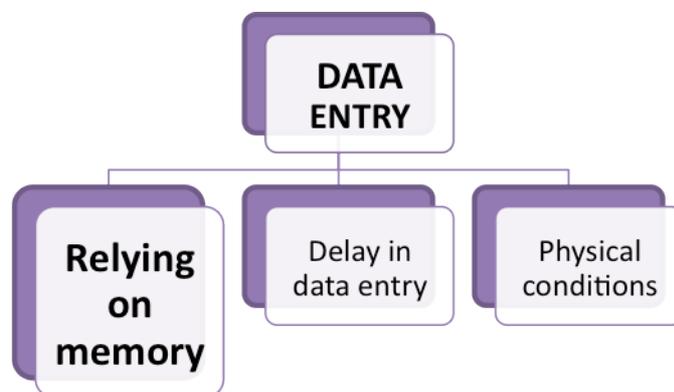


Figure 95: Relying on memory

Participants revealed that they often rely on memory when entering perinatal data into the computer. The difference between memory recall for data entry and point of care documentation suggests that the longer the time between an event occurring and the recording of that event, the less accurate the information (Carlson, et al., 2010; Porter &

Mandl, 1999). Evidence that such time lag affects the quality and amount of information recorded is seen in research with physicians following client visits (Porter & Mandl, 1999).

As was stated in Chapter 2, transcription error is one cause of data inaccuracy. Such error is thought to have a close relationship to system design, with the Institute of Medicine of the USA concluding that, while human error is considered a factor, often this human error is a direct result of a system or process failure (Institute of Medicine, 2000). Relying on memory is seen as contributing to such error and therefore another source of inaccurate data (Voyer, et al., 2013). Utilisation of menu-based interactions in software is believed to rely much less on memory recall (Davis & Wiedenbeck, 2001). However, any use of memory to enter data carries with it a risk of miss-matched data with other sources, such as the medical record.

Accuracy of perinatal data is paramount to the quality of information provided by the central collection unit, as well as the trust in that information at a more local, unit level. Therefore, utilising memory for data entry needs to be discouraged. As healthcare institutions move beyond current systems of duplication of recording (paper medical records as well as sometimes numerous computer records), single point of data entry will occur, thus removing the risk of error accruing via reliance on memory. However, it is imperative that the data entered in such single point of entry systems be accurate data. Discouraging midwives reliance on memory for perinatal data entry should in part assist in preparing them for such a future.

## Delay in data entry

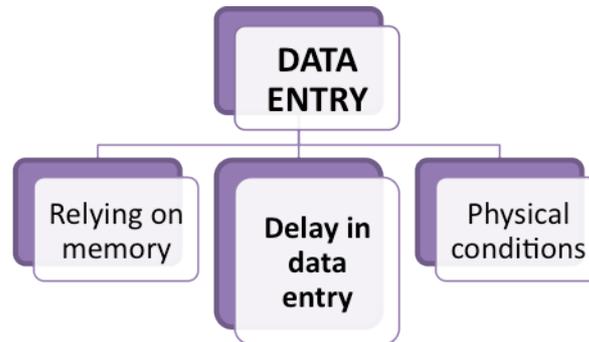


Figure 96: Delay in data entry

With the introduction and infiltration of electronic health records (EHR) occurring throughout healthcare, timely data entry is presumed to be the underlying requirement for accurate recording of health care information (Carlson, et al., 2010). Kohle-Ersher et al. (2012, p. 126) identify that “...documenting care at the time that care is delivered increases the accuracy of the documentation”. These authors go on to identify that delays in entering data into an EHR can result in errors in the data because of information being forgotten in the period between the event and recording of that event.

The findings from this research show that most participants experience some delay, hours or even days, in the recording of perinatal data into the computer. Point of care perinatal data entries in antenatal clinics, as described by participants of this research, are a possible exception. Within the literature, research into vital signs documentation by nurses (Carlson, et al., 2010) reported entry of data into a stationary computer at the nurses’ desk was associated with longer delays than using mobile or handheld devices. However even these mobile devices, offering the option of point of care data entry, had data entry within one hour in 71.5 percent of cases. The stationary desktop computers

were preferred by staff when having to enter lengthier or more complex data. This would be comparative to the lengthier perinatal data to be entered in the birth suite after the birth of a baby. Further to this, Fieler, Jaglowski and Richards (2013) found an error rate of 18.75 percent via paper recording of vital signs with later transcription into a Health Information System, (HIS) with a mean waiting time for entry into the electronic medical record (EMR) of 38.53 minutes.

Other authors like Car et al. (2008) and Kerr and Norris (2008) found that there is a need for the use of technology in order to avoid the requirement of transcribing information from paper to computer records, and to improve accuracy. Use of mobile technology and point of care data entry is seen as the key to this. However, other authors (Moody, Slocumb, Berg & Jackson, 2004) identified that healthcare workers were recording data on paper and later transferring the same data into an EHR due to the inconvenience of using point of care documentation technology. Moody et al. (2004) reported admitted client rooms were too crowded, and that healthcare workers experienced interruptions while trying to use EHRs at the bedside. In contrast, Carlson, et al. (2010) found that some point of care technology was found to be user-friendly and reliable. The findings of this research regarding delays in entry of perinatal data may also have led to inaccuracies that could potentially be avoided with utilisation of point of care data entry technology.

## Physical conditions

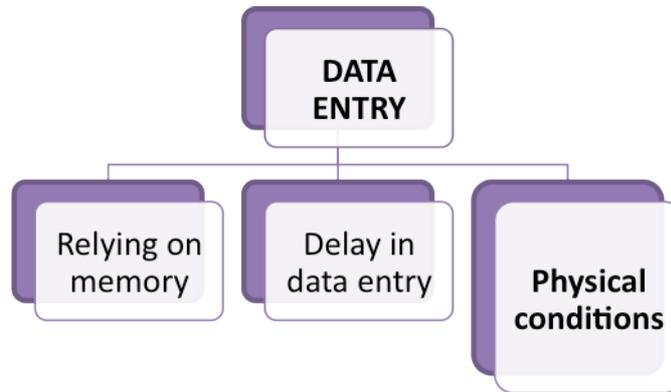


Figure 97: Physical conditions

Point of care data entry is seen as a solution to some of the issues already mentioned in relation to data entry. Therefore, computing equipment at the point of care is required. As previously alluded to, in some areas of midwifery work this can be problematic. This research found that midwives are concerned about body fluid exposure to such devices when used in a birthing environment, and a resultant inoperability. Body fluids splashed on to paper did not appear to be as much of a concern. This new finding also adds to the literature researching the value of integrating mobile devices into healthcare.

Within the literature on infection control, research findings by Bures, Fishbain, Uyehara, Parker and Berg (2000) identified that computer keyboards are infected with pathogens including MRSA, at rates of 24 to 26 percent. This is more than double that of tap handles in the same client rooms. Their findings have since been replicated by others as reported by Neely, MacGregor, Bush and Lighter (2005) in their literature review concerning the area of computer equipment and infection. As a result of their review, recommendations for cleaning and disinfection, as well as the wearing of gloves, have been made.

Participants in this research report they are already wearing gloves in the birth suite due to the nature of birthing, but these are constantly wet and contaminated. Removing gloves for regular computer data entry and then putting new ones on was not discussed by participants at interview. As such, the delay in data entry and entering data from memory are perpetuated, affecting accuracy of the perinatal data collection. The use of tablets in this environment was suggested by some participants as a possible solution to the need for point of care data entry. Recent research suggests tablets are a powerful clinical tool, with an increase in the use of such devices within healthcare (Manning, Davis, Sparnon & Ballard, 2013). The same research also suggests that not enough attention is being paid to their appropriate use and effective cleaning and disinfection. These authors go on to make recommendations based on the centres of disease control guidelines for other medical equipment, and how tablets and mobile hand held devices should be cleaned and disinfected.

The element **data entry** suggests that the delay in perinatal data entry, relying on memory and the physical conditions of birth for using technology to enter timely data, all pose barriers for midwives against fulfilling the requirement of successfully entering perinatal data. Professional development for staff highlighting the inaccuracy of using memory for data recall, improvement in the availability of point of care data entry via easier access to computers or mobile devices, and policy on how these may be cleaned and disinfected appropriately, may lead to midwives beneficially engaging with the process of perinatal data entry. It also highlights the relationship between the elements **data entry** and **knowledge**. **Data entry** also has a relationship with the element

**workload** as prioritising perinatal data entry when challenges in finding available computers or systems at point of care exist, may lead to demoting the activity further down the priority list. Furthermore, when gloves are on and accessing computers an infection control risk, consideration needs to be made to ways to deal with this so midwives so not further demote the activity of perinatal data entry. Transfer of **accountability** occurs if midwives then pass on the perinatal data entry of women in their care as a result of this lack of priority showing the relationship between **accountability** and **data entry**. These are demonstrated in Figure 98. Optimisation of the element **data entry**, as described above, can be compared to creating positive job resources for the midwife. This has been shown in research on long-term work engagement to relate positively to work engagement (Schaufeli & Bakker, 2004; Xanthopoulou, et al., 2009).

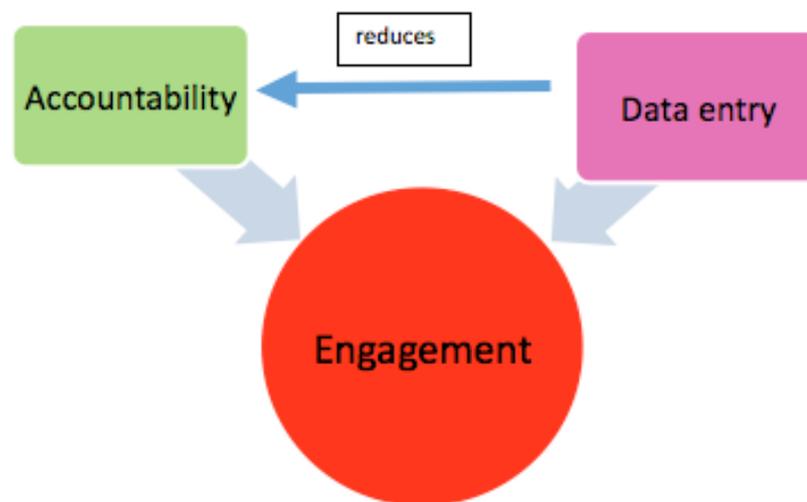


Figure 98: Relationships for the element data entry

While it might seem years away, recent news that paperless systems are being rolled out to intensive care units of major hospitals in Queensland was reported by the Health Informatics Society of Australia (HISA) stating;

The Royal Brisbane and Women's, Princess Alexandra and Royal Children's Hospitals will join Gold Coast, Prince Charles, Townsville, Rockhampton, Cairns and Logan hospitals (in Queensland, Australia) in using the system (an EMR) as part of a statewide enterprise roll out that will hopefully take in the rest of the smaller regional hospitals as well.

(McDonald, 2013, p. 26).

Such changes are destined to come to maternity units and successful, accurate, timely, and complete perinatal data entry will assist in preparing midwives for such an event.

## Summary

This research identified nine elements and contributing themes which emerged from the data examining the factors that influence midwives interaction with the computer when collecting and entering perinatal data. These elements and their supporting themes were discussed in this chapter, situating the findings within the literature. Reinforcement of the findings occurred via the support of published literature in the area of midwifery, ICT, and perinatal data. Together, the nine identified elements inform **The Theory of Beneficial Engagement**, which proposes that modification of these identified elements that participants experience in relation to perinatal data entry, to an optimal state, may lead to midwives beneficially engaging with the process of entering perinatal data. It is purported that optimising any, some, or all of the elements of engagement in order to overcome barriers to perinatal data entry may lead to achieving more timely, complete and accurate perinatal data entry into a computer. The final chapter will provide

recommendations from this research based on the findings, as well as those for further research in this area. Lastly the limitations of this study will be discussed.

## CHAPTER 6 – LIMITATIONS, RECOMMENDATIONS AND CONCLUSION

The aim of this research was to understand the factors that influence midwives interaction with the computer when collecting and entering perinatal data and during the process, to generate a substantive theory, which explains this phenomenon. **The Theory of Beneficial Engagement**, elicited from this research, describes the process through which midwives can move from engaging with perinatal data to a beneficial engagement. This may occur via the optimisation of nine identified elements that work to either enhance, or create barriers to successful achievement of perinatal data entry into a computer. The chapters prior to this point in the thesis have presented an introductory overview, the background to the study, the research design, the findings, and a discussion of those findings within the context of the existing literature in this area. To conclude this thesis, the contribution to nursing knowledge, existing limitations, recommendations arising from this research as well as recommendations for further research will be addressed.

### **Theoretical contribution to knowledge**

This study is unique in that it explored an area of midwifery practice that has not yet been studied in the literature in relation to entry of perinatal data into the computer with a particular focus on the state of Queensland, Australia. The findings provide insight into the many issues that arose for participants in the process of achieving this aim, and identified areas where improvements can be made. The key findings emerging from the data that provide new insight into midwifery practice relating to perinatal data entry

using computers, coalesce around the elements accountability, valuing, workload and shifting focus with the emergent issues around data entry supremely important for the maternity domain. In particular, there is no governance for perinatal data entry and midwives are not held to account for their entries. This has a follow on effect, as those who make errors cannot always be tracked, asked to correct their errors and therefore improve their accuracy in future perinatal data entry. **Shifting focus** from the mother to the computer when utilising point of care computing during consultations causes frustration and potentially leads to missed information via poorer communication. **Valuing** perinatal data entry emerged as relating to engagement yet not all users of perinatal data systems value the process. A lack of understanding of its use contributed to this. While **workload** is an issue in all areas of healthcare, unless management support, via the allocation of time to enter perinatal data, is made, the process is given inadequate priority during a busy day. The emergent findings within the element **data entry** identify direct actions that can be taken to enhance midwives' ability to enter perinatal data, accounting for infection control while improving point of care recording of data. Collectively, these findings provide new knowledge into how computers are used within maternity for perinatal data entry and identification of areas where immediate improvement can be made.

The proposed substantive theory further contributes to midwifery knowledge in understanding how identification and optimisation of the elements specific to computerised perinatal data entry may lead midwives to a beneficial engagement with perinatal data. Such findings have implications in the areas of education, physical modification of midwifery units, design of software for perinatal data collection, and

identifying areas for further research in this important and dynamic area. It may be suggested that simply optimising the elements obstructing perinatal data entry i.e. via improving workload, providing better professional development, allocating more computers are the point of care, and instigating governance for perinatal data entry, may contribute to more complete and accurate data entry. However, it is proposed that while midwives do not see perinatal data entry as part of their role and understand the value of the process, this alone will not be successful. Provision of knowledge about the use and relevance of information that can be obtained from the perinatal data collection and how this has a direct effect on the care of mothers and babies may lead to the development of intrinsic valuing and understanding. This in turn will assist midwives to beneficially engage with perinatal data entry, and lead to them being more able to overcome barriers independently. This contribution to new knowledge stemmed from methodological research process using grounded theory methodology. However, regardless of the attention paid to assuring credibility in this research and the identified contributions to midwifery knowledge, limitations exist and will now be presented.

### **Limitations**

All research has limitations (Creswell, 2003). Although this research was conducted within accepted standards of credibility, explicated in Chapter 4, it too, is not without limitation. Firstly the number of interviewed participants, n=15, was small and purposively selected from within the state of Queensland, Australia. This is consistent with a qualitative, Grounded Theory approach to research. However, this resulted in an inability to generalise results to midwives in other areas, states or countries. Even

though the findings may not be generalised, it is suggested that midwives undertaking the entry of perinatal data into a computer may find the elements explained here pertinent to their workplace. Additionally, the findings in this study were based on self-reports or perceptions communicated by participants during interviews. Consequently, the extent to which the perceptions of participants and their recall accurately reflected the actual conditions of perinatal data entry into the computer is not known. As a result, the findings should be interpreted with caution, but there are no indications that the findings reflect biased participant reporting or researcher perspectives. Finally, the research and resulting substantive Grounded Theory presented in this thesis is limited by the researcher's novice approach to the use of Grounded Theory methodology. The process undertaken was methodologically true to Grounded Theory methods and every attempt was made to ensure that credibility and reliability were adhered to. With the experience gained from this research, confidence in using the method in the future has increased, and greater trust placed in the emergence of concepts and theory will exist for the researcher.

### **Recommendations for midwifery practice**

In examining the factors that influence midwives interaction with the computer when collecting and entering perinatal data, this study has highlighted many key areas that need to be addressed within midwifery practice in regard to the entry of perinatal data into a computer. The recommendations are linked to the particular element and finding that informed each one.

Recommendations:

**Accountability** encompassed the key finding that midwives are not generally held accountable for their perinatal data entry resulting in a reduced the responsibility felt by participants. For this reason, it is recommended that:

- Accountability for individual perinatal data entries should be credited to and taken on by midwives, preferably with a signoff for completion via instigation of governance; this would result in the mistakes by individual midwives being identifiable

Furthermore, given that findings from this research within the element **software** included frustration when data entered was lost if called away from the computer, as well as a lack of technical support for both queries in system usage and reinstatement of passwords when locked out, the following recommendations are made:

- Perinatal data software requires a standard automatic saving function so that any data entered is saved regardless of user competence in remembering to do so
- Twenty-four hour technical support should be available to all users of perinatal data software, coordinated by technicians familiar with the particular software in use for perinatal data entry, not just software in general
- Appropriately authorised users should be available to unlock passwords across all shifts, seven days a week

Additional findings in the element **software** were that midwives are not a part of the design process of systems they will ultimately use such as those for perinatal data entry.

Therefore it is recommended that:

- Any new software being developed that includes the facility to collect perinatal data needs to have clinical midwives as part of the design, development and implementation team, so that a focus on the user needs is uppermost and the software can be designed so that midwife users will want to use it

Other findings from this research within the element **knowledge** showed that participants had difficulty accessing training materials. It is therefore recommended that:

- Knowledge of, location of, and access to training manuals for perinatal data software use should be clear and accessible to all users

Given that the findings within the element **data entry** included not having enough computers for midwives to access when the time presented itself for perinatal data entry, it is recommended that:

- Computer hardware should be placed in locations for midwives to use for data entry so that when the time presents itself to be able to enter the data, a computer is available. This may mean extra hardware provision or dedicated ‘midwives only’ computers in all areas where midwives require access – antenatal clinic, the birth suite, and the postnatal ward

- Point of care computing, whether hand-held, mobile or desktop is recommended in conjunction with clinical midwives to ensure placement does not interfere with the midwifery model of care

Additionally the nature of birth and maternity related care of women and babies lead to the finding also within the element **data entry**, that the use of computers within maternity units is not aligned with associated governance that ensures safe practice. As such it is recommended that:

- Infection control policy should include the use of touch screens and computer keyboards

Finally, the key finding within the element **workload**, was that finding that the time to enter accurate and complete perinatal data was often lacking, it is recommended that maternity units:

- Phase out of data duplication – system interoperability needs to be increased as further health information systems are introduced into midwifery practice, with a move toward single point of data entry being critical
- Time for perinatal data entry needs to be provided within allocation of duties for every shift, and staffing trends should account for the priority of perinatal data entry

### **Recommendations for professional development**

The key findings from the elements **knowledge**, **value** and **perceived benefits** focused around a lack appropriate and consistent professional development to ensure they

understand how to use the system, the importance of accurate data and the use of perinatal data in the clinical care of the mothers and babies they undertake. For this reason, it is recommended that:

- Midwives need to be given information via professional development about the importance of perinatal data collection in order to promote their understanding of the use of the data collected, the benefits for mother and baby, the benefits at a unit level, and the wider benefits state-wide and across Australia. The implications of inaccurate data entry also need to be provided to keep midwives focused on data entry accuracy
- Midwives need to be helped to understand the visible and immediate benefits to both themselves and the women and babies in their care
- Consistency of professional development across staff within institutions and across similar systems should be implemented in different institutions. Such training needs to include: identification of which items of collection are mandatory, specific information on field definitions, and where to find descriptions of these items in practice for reference while entering perinatal data
- Requirement for further professional development for midwife users of perinatal data systems on how to prevent recurrent errors in data entry

- Any training and professional development should include explanation to midwives of why the system functions as it does i.e. why security is at a particular level and regular password changing is critical

Further to this, security within the element **data entry** encompassed the finding that password sharing is ongoing in maternity units in Queensland. As such it is recommended that:

- Password sharing needs to be treated as a breach of information security and midwives educated on its dangers. However, as recommended above, authorised persons need to be present to ensure midwives who are locked out are reinstated quickly (on the same shift) and visiting midwives are either given temporary access

It also emerged from this research within the element **data entry** that data entry was not always done at the time of the particular event of care and often some delay in perinatal data entry occurred. In an attempt to rectify this, it is recommended that:

- Reliance on memory for entering data should be discouraged and midwives should be encouraged to copy from written records at all times while such duplication persists
- Implementation of point of care computing to negate the reliance on memory and transcription error is required. Use of mobile computer technology for perinatal data entry may be an answer

As healthcare continually evolves, more and more midwifery units may move toward paperless technology and the use of health information systems where perinatal data will be extracted from that system. In that case, the issue of non-clinical personnel entering perinatal data becomes redundant. This change could also bring in a single point of data entry, reducing duplication of data from paper to computer software, and multiple entry of the same data into systems which are failing to be interoperable – unable to communicate with each other. Until this time, it is proposed that these recommendations need to be heeded to ensure that accuracy in perinatal data into a computer is foremost.

### **Recommendations for further research**

As a result of the findings from this research, it is recommended that further research be carried out to test **The Theory of Beneficial Engagement** within a population of midwives using computers for perinatal data entry. A quantitative study with a much larger sample group would assist in determining whether the emergent evidence informing the nine elements affecting perinatal data entry across the participants of this research is replicated across a wider group of midwives. In addition, research testing the purported substantive theory that optimisation of any, some or all of the emergent elements through avenues such as education and professional development of midwife users, will in fact lead to beneficial engagement, needs to be carried out. Further research is also required to assess the understanding of the requirements for perinatal data entry, particularly field definitions by midwives. An additional study examining mandatory use of computer systems versus voluntary use within midwifery is

recommended, due to the different interactions employees have with each type of system. Research may also be carried out to determine the extent of password sharing and the awareness by employees of the breaching of healthcare institution policy.

Lastly, further research is recommended into the public perception of use of computers by midwives as part of their professional role due to the finding from this research that midwives are concerned about perceptions that computers are not an integral part of the midwifery model of care.

## Summary

Midwives in Queensland, Australia, use various forms of software to enter perinatal data. The accuracy of the perinatal data collection and the timeliness of availability of the information are believed to have improved since the move from paper to computerised collection (Data Collections Unit, 2011). However, this research has identified factors that influence the entry of perinatal data by midwives, creating barriers to successful data entry. Overcoming the barriers identified in this research may be achieved via beneficially engaging with perinatal data entry focusing on identifying, for each midwife, the immediate benefit to themselves and the mothers and babies in their care. This forms the basis of **The Theory of Beneficial Engagement** informed by the core category of **engagement** and the nine elements of **accountability, valuing, adapting, perceived benefits, workload, shifting focus, software, knowledge and data entry**. These findings add to midwifery knowledge and create recommendations for improvements to practice via physical changes in availability and placement of

computers, clinician involvement and improvements in design of software, and changes to professional development education. The integrity of the perinatal data collection has a direct effect on the quality of care provided to mothers and babies. Midwives, as reported in this research, want to do the right thing, so movement towards beneficially engaging with perinatal data entry by all midwives could lead to improved accuracy and timeliness of perinatal data entry.

In order to motivate users to engage with ICT for perinatal data entry, the system is required to be meaningful and relevant to them. Making systems mandatory without addressing such needs challenges this.

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## APPENDIX A: METADATA FOR THE PERINATAL NATIONAL MINIMUM DATA SET (NMDS)



Australian Government  
Australian Institute of  
Health and Welfare



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### Perinatal NMDS 2014-15

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#### Identifying and definitional attributes

<i>Metadata item type:</i> <a href="#">i</a>	Data Set Specification
<i>METeOR identifier:</i> <a href="#">i</a>	517456
<i>Registration status:</i> <a href="#">i</a>	Health, Standardisation pending 20/11/2013
<i>DSS type:</i> <a href="#">i</a>	National Minimum Data Set (NMDS)
<i>Scope:</i> <a href="#">i</a>	The scope of the Perinatal national minimum data set (NMDS) is all births in Australia in hospitals, birth centres and the community. The data set includes information on all births, both <b>live births</b> and <b>stillbirths</b> , of at least 20 weeks gestation or 400 grams birth weight.
	These data have two dimensions, which are the baby and the mother. All data relevant to the birth are conveyed in relation to one of these.

#### Collection and usage attributes

<i>Collection methods:</i> <a href="#">i</a>	<i>National reporting arrangements</i> State and territory health authorities provide the data to the Australian Institute of Health and Welfare for national collation, on an annual basis. Data are managed by the National Perinatal Epidemiology and Statistics Unit.
	<i>Periods for which data are collected and nationally collated</i> Financial years ending 30 June each year.
<i>Implementation start date:</i> <a href="#">i</a>	01/07/2014
<i>Implementation end date:</i> <a href="#">i</a>	30/06/2015
<i>Comments:</i> <a href="#">i</a>	<i>Glossary items</i> Glossary terms that are relevant to this National minimum data set are included here.

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**Grounded Theory examination of the factors that influence midwives when entering perinatal data:**  
**The Theory of Beneficial Engagement**

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[Anaesthesia](#)  
[Analgesia](#)  
[Antenatal care visit](#)  
[Birthweight](#)  
[Geographic indicator](#)  
[Hospital-in-the-home care](#)  
[Live birth](#)  
[Registered nurse](#)  
[Separation](#)  
[Stillbirth \(fetal death\)](#)

### Relational attributes

Related metadata references:<sup>i</sup>

Supersedes [Perinatal NMDS 2013-14 Health, Standard 07/02/2013](#)

Implementation in Data Set Specifications:<sup>i</sup>

[Perinatal DSS 2014-15 Health, Standardisation pending 15/11/2013](#)

[Parent DSS specific attributes +](#)

### Metadata items in this Data Set Specification<sup>i</sup>

[Show more detail](#)

Seq No. <sup>i</sup>	Metadata item <sup>i</sup>	Obligation <sup>i</sup>	Max occurs <sup>i</sup>
-	Birth event—anaesthesia administered indicator, yes/no code N	Mandatory	1
-	Birth event—analgesia administered indicator, yes/no code N	Mandatory	1
-	Birth event—birth method, code N	Mandatory	1
-	Birth event—birth plurality, code N	Mandatory	1
-	Birth event—birth presentation, code N	Mandatory	1
-	Birth event—labour onset type, code N	Mandatory	1
-	Birth event—setting of birth (actual), code N	Mandatory	1
-	Birth event—state/territory of birth, code N	Mandatory	1
-	Birth event—type of anaesthesia administered, code N[N]	Conditional	7
-	Birth event—type of analgesia administered, code N[N]	Conditional	6
-	Birth—Apgar score (at 5 minutes), code NN	Mandatory	1
-	Birth—birth order, code N	Mandatory	1
-	Birth—birth status, code N	Mandatory	1
-	Birth—birth weight, total grams NNNN	Mandatory	1
-	Episode of admitted patient care—separation date, DDMMYYYY	Mandatory	2
-	Establishment—organisation identifier (Australian), NNX1X1NNNNN	Mandatory	1

- Female (mother)—postpartum perineal status, code N[N]	Mandatory	2
- Female (pregnant)—number of cigarettes smoked (per day after 20 weeks of pregnancy), number N[NN]	Conditional	1
- Female (pregnant)—tobacco smoking indicator (after twenty weeks of pregnancy), yes/no code N	Mandatory	1
- Female (pregnant)—tobacco smoking indicator (first twenty weeks of pregnancy), yes/no code N	Mandatory	1
- Female—caesarean section at most recent previous birth indicator, code N	Mandatory	1
- Female—number of antenatal care visits, total N[N]	Mandatory	1
- Female—parity, total pregnancies N[N]	Mandatory	1
- Person—area of usual residence, statistical area level 2 (SA2) code (ASGS 2011) N(9)	Mandatory	1
- Person—country of birth, code (SACC 2011) NNNN	Mandatory	1
- Person—date of birth, DDMMYYYY	Mandatory	2
- Person—Indigenous status, code N	Mandatory	2
- Person—person identifier, XXXXXX[X(14)]	Mandatory	2
- Person—sex, code N	Mandatory	1
- Pregnancy—estimated duration (at the first visit for antenatal care), completed weeks N[N]	Mandatory	1
- Product of conception—gestational age, completed weeks N[N]	Mandatory	1

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# APPENDIX B: IMAGE OF PAPER PERINATAL DATA COLLECTION FORM USED IN QUEENSLAND

## QUEENSLAND PERINATAL DATA COLLECTION FORM

<b>MOTHER'S DETAILS</b>	PLACE OF DELIVERY _____	DATE OF ADMISSION (for delivery) _____	SURNAME _____	UR No. _____
	MOTHER'S COUNTRY OF BIRTH _____	SEROLOGY _____	FIRST NAME _____	DOB _____
<b>PREVIOUS PREGNANCIES</b>	INDIGENOUS STATUS _____	MARITAL STATUS _____	ACCOMMODATION STATUS OF MOTHER _____	USUAL RESIDENCE _____
	Aboriginal _____	Never Married _____	Public _____	POSTCODE _____ STATE _____ SLA _____
<b>PRESENT PREGNANCY</b>	PREVIOUS PREGNANCIES _____	METHOD OF DELIVERY OF LAST BIRTH _____	ANTENATAL TRANSFER _____	Time of transfer _____
	Number of previous pregnancies resulting in: _____	Number of previous caesareans _____	Reason for transfer _____	Transferred from _____
<b>LABOUR AND DELIVERY</b>	LMP _____	NUMBER OF VISITS _____	PREGNANCY COMPLICATIONS _____	PROCEDURES AND OPERATIONS _____
	EDC _____	CURRENT MEDICAL CONDITIONS _____	PH/PE _____	ULTRASOUNDS _____
<b>LABOUR AND DELIVERY</b>	HEIGHT _____ cm	WEIGHT _____ kg	INTENDED PLACE OF BIRTH AT ONSET OF LABOUR _____	ACTUAL PLACE OF BIRTH OF BABY _____
	ANTENATAL CARE _____	MEMBRANES RUPTURED _____	LENGTH OF LABOUR _____	PRESENTATION AT BIRTH _____
<b>LABOUR AND DELIVERY</b>	WATER BIRTH _____	REASON FOR FORCEPS/VACUUM _____	REASON FOR CAESAREAN _____	PLACENTA / CORD _____
	PRINCIPAL ACCOUCHEUR _____	PERINEUM _____	PHARMACOLOGICAL ANALGESIA DURING LABOUR/DELIVERY _____	ANAESTHESIA FOR DELIVERY _____
<b>LABOUR AND DELIVERY</b>	LABOUR AND DELIVERY COMPLICATIONS _____	CTG in labour? _____	FSE in labour? _____	Fetal scalp pH? _____
	CTG in labour? _____	FSE in labour? _____	Fetal scalp pH? _____	Lactate? _____

MRRSD HSC-DATA COLLECTIONS UNIT/6 JULY 2009

## APPENDIX C: EXAMPLE OF THEORETICAL MEMO: **WORKLOAD**

12/11/2012 2:07 PM Element: Workload (Shortened from Managing workload) (previously called Prioritising Time and previous to that Being busy)

This element has evolved from early codes time to include the issues participants communicate regarding finding the time for PD. Their workload impacts on their ability to enter PD. This has merged with code prioritising/prioritising time as engagement with PD appears to result in a higher priority placed on finding the time.

What is the data saying?

Some midwives use computers for non-work activity when they could be completing PD, preparing for new admissions in times of less workload (P2, P8) found frustrating by others. Staffing levels are inadequate at other times when it is very busy and PD gets left - some midwives find the time to enter their data at a later time or date (P1, P2, P5, P13). Some midwives do not.

As new innovations in HC come in, the midwives are expected to pick up the load - no new staff are supplied to do it (P2, P4). Poor administration staff cover (P2, P4 & P8). PD entry is not generally found as an easy task to do and therefore it is not only time consuming but annoying to the midwives who have a list of other more important things to do. Interrupted by other tasks, frustrated by wasted time looking for information in written documentation.

What does it mean?

The name 'Workload' signifies that the workplace is busy and **time** is a precious commodity. Staffing levels are not always adequate and finding the time to enter the data is difficult. Therefore the midwives need to prioritise their time to include PD and in some cases they do/will not. The **paper chart takes priority** when time is short but engaged midwives will find the time at a later date to come back to it. Non-engaged midwives do/will not.

There may be some role for management here - those that support PD will identify the priority and make more time for the staff - Int 12: "In birth suite sometimes if the girls are extremely busy and they don't have time to do it , someone will be allocated to just do the PD's that haven't been finished."

Initially this appeared to be simply what happens in workplaces – when it's busy, staff get in and do the work, when it is slow, they slow down too. But on closer examination this appears to relate to the understanding in relation to priority placed on the task at hand. Those who appear to understand the value of PDE find the time even within a busy workload as it is higher on the chain of must do activities. Computers/entering data are a frustrating part of the job and yet it comes back to engagement – those who can see the value of the activity make time for that activity while others fall back on seeing it as non-nursing work, joking about letting a patient bleed to death “but my PD is done” (P14).

What are the relationships?

Workload strongly relates to Entering PD for others as those placing the lower priority on the task readily pass it on to others. Duplicating data - copying information from paper to computer, inputting data into more than 1 sometimes 3 or 4 different systems that are incompatible increases the frustration felt and the workload experienced. Focus on care of mother and baby - "I think, (pause) I think often they see it as an impost, that it imposes on their time to provide clinical care." (P11) - when there is not enough time, PD is that thing that slides.

Data in this substantive theme (element?) encompasses nodes:

Time spent correcting or completing electronic entries

Time entering perinatal data

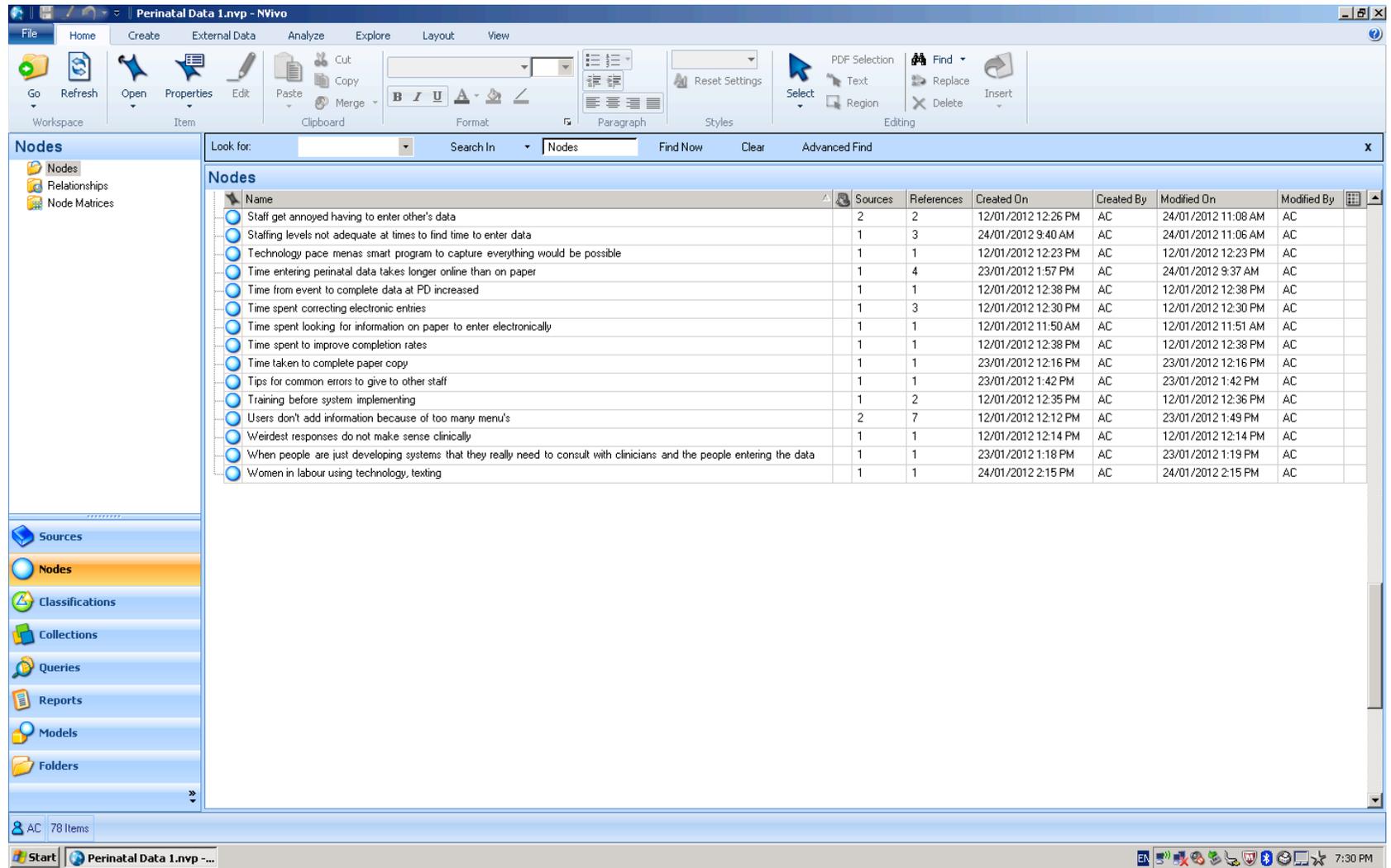
Management make decisions about who should enter the data

Management interested in data

Staffing levels - not adequate at times to find time to enter data

Paper priority over electronic system

**APPENDIX D: SCREEN SHOTS FROM EARLY TO LATE ITERATIONS OF NVIVO FILES DEMONSTRATING THE DEVELOPMENT OF THE CODES RELATING TO ‘TIME’ INTO THE ELEMENT ‘WORKLOAD’**



Grounded Theory examination of the factors that influence midwives when entering perinatal data:  
The Theory of Beneficial Engagement

The screenshot shows the NVivo software interface with a list of nodes. A blue oval highlights the following nodes:

- Time entering perinatal data takes longer online than on paper
- Time from event to complete data at PD increased
- Time spent correcting electronic entries
- Time spent looking for information on paper to enter electronically
- Time spent to improve completion rates
- Time taken to complete paper copy

Name	Sources	References	Created On	Created By	Modified On	Modified By
Staff get annoyed having to enter other's data	2	2	12/01/2012 12:26 PM	AC	24/01/2012 11:08 AM	AC
Staffing levels not adequate at times to find time to enter data	1	3	24/01/2012 9:40 AM	AC	24/01/2012 11:06 AM	AC
Technology pace means smart program to capture everything would be possible	1	1	12/01/2012 12:23 PM	AC	12/01/2012 12:23 PM	AC
Time entering perinatal data takes longer online than on paper	1	4	23/01/2012 1:57 PM	AC	24/01/2012 9:37 AM	AC
Time from event to complete data at PD increased	1	1	12/01/2012 12:38 PM	AC	12/01/2012 12:38 PM	AC
Time spent correcting electronic entries	1	3	12/01/2012 12:30 PM	AC	12/01/2012 12:30 PM	AC
Time spent looking for information on paper to enter electronically	1	1	12/01/2012 11:50 AM	AC	12/01/2012 11:51 AM	AC
Time spent to improve completion rates	1	1	12/01/2012 12:38 PM	AC	12/01/2012 12:38 PM	AC
Time taken to complete paper copy	1	1	23/01/2012 12:16 PM	AC	23/01/2012 12:16 PM	AC
Tips for common errors to give to other staff	1	1	23/01/2012 1:42 PM	AC	23/01/2012 1:42 PM	AC
Training before system implementing	1	2	12/01/2012 12:35 PM	AC	12/01/2012 12:36 PM	AC
Users don't add information because of too many menu's	2	7	12/01/2012 12:12 PM	AC	23/01/2012 1:49 PM	AC
Weirdest responses do not make sense clinically	1	1	12/01/2012 12:14 PM	AC	12/01/2012 12:14 PM	AC
When people are just developing systems that they really need to consult with clinicians and the people entering the data	1	1	23/01/2012 1:18 PM	AC	23/01/2012 1:19 PM	AC
Women in labour using technology, texting	1	1	24/01/2012 2:15 PM	AC	24/01/2012 2:15 PM	AC

Early analysis leads to proliferation of codes with 'time' appearing linked to many different terms.

Grounded Theory examination of the factors that influence midwives when entering perinatal data:  
 The Theory of Beneficial Engagement

Perinatal Data 1 (3).nvp - NVivo

File Home Create External Data Analyze Explore Layout View

Go Refresh Open Properties Edit Paste Copy Merge B I U Format Paragraph Styles Select PDF Selection Find Replace Delete Insert

Workspace Item Clipboard Format Paragraph Styles Editing

Nodes

Look for: Search In Nodes Find Now Clear Advanced Find

Nodes

Name	Sources	References	Created On	Created By	Modified On	Modified By
Staffing levels	3	5	27/01/2012 12:01 PM	AC	8/05/2012 11:54 AM	AC
Staffing levels not adequate at times to find time to enter data	3	6	24/01/2012 9:40 AM	AC	1/05/2012 2:47 PM	AC
Stressed by technology	2	2	21/02/2012 1:55 PM	AC	8/05/2012 12:06 PM	AC
System development like the paper form like a pantogram	1	1	21/02/2012 2:06 PM	AC	1/05/2012 2:47 PM	AC
Technology pace means smart program to capture everything would be possible	1	1	12/01/2012 12:23 PM	AC	1/05/2012 2:47 PM	AC
Technology pervading birth	3	5	24/02/2012 9:37 AM	AC	1/05/2012 2:47 PM	AC
Time entering perinatal data	5	9	23/01/2012 1:57 PM	AC	8/05/2012 12:06 PM	AC
Time from event to complete data at PD increased	1	1	12/01/2012 12:38 PM	AC	1/05/2012 2:47 PM	AC
Time spent correcting or completing electronic entries	3	6	12/01/2012 12:30 PM	AC	1/05/2012 2:47 PM	AC
Time spent looking for information on paper to enter electronically	3	4	12/01/2012 11:50 AM	AC	1/05/2012 2:47 PM	AC
Time spent training to improve completion rates	2	2	12/01/2012 12:38 PM	AC	1/05/2012 3:06 PM	AC
Time taken to complete paper copy	1	1	23/01/2012 12:16 PM	AC	1/05/2012 2:47 PM	AC
Tips for common errors to give to other staff	2	3	23/01/2012 1:42 PM	AC	1/05/2012 2:47 PM	AC
Training before system implemented	7	12	12/01/2012 12:35 PM	AC	2/05/2012 12:46 PM	AC
Understanding of use of perinatal data, focus on PD	5	9	21/02/2012 1:20 PM	AC	2/05/2012 12:56 PM	AC
Users don't add information because of too many menu's	3	7	12/01/2012 12:12 PM	AC	1/05/2012 2:47 PM	AC
Using computers at home	3	4	27/01/2012 1:45 PM	AC	2/05/2012 12:52 PM	AC
Using computers at work	1	3	27/01/2012 1:57 PM	AC	1/05/2012 2:47 PM	AC
Using PD summary for other HP's	1	2	2/05/2012 11:43 AM	AC	2/05/2012 12:56 PM	AC
Using perinatal data statistics	2	5	30/01/2012 1:38 PM	AC	1/05/2012 2:47 PM	AC
Wasting time entering data for women who birth elsewhere	1	1	2/03/2012 1:04 PM	AC	1/05/2012 2:47 PM	AC
Weirdest responses do not make sense clinically	3	3	12/01/2012 12:14 PM	AC	1/05/2012 2:47 PM	AC
When people are just developing systems that they really need to consult with clinicians and the people entering the data	2	2	23/01/2012 1:18 PM	AC	1/05/2012 2:47 PM	AC
Women in labour using technology, texting	1	1	24/01/2012 2:15 PM	AC	1/05/2012 2:47 PM	AC
Work ethic	4	16	27/01/2012 1:43 PM	AC	1/05/2012 2:47 PM	AC
Workflow of paper chart moving in and out of birth suite	2	2	22/03/2012 12:07 PM	AC	1/05/2012 2:48 PM	AC

Number of sources and references to the codes relating to time increasing with coding and memos

AC 140 Items

Start Perinatal Data 1 (3).n... Document1 - Microsoft ... 7:33 PM

Grounded Theory examination of the factors that influence midwives when entering perinatal data:  
The Theory of Beneficial Engagement

Perinatal Data with tree nodes\_050612.nvp - NVivo

File Home Create External Data Analyze Explore Layout View

Go Refresh Open Properties Edit Paste Copy Merge B I U Paragraph Styles Select PDF Selection Find Replace Delete Insert

Workspace Item Clipboard Format Paragraph Styles Editing

Nodes

Look for: Search In Nodes Find Now Clear Advanced Find

Nodes

Name	Sources	References	Created On	Created By	Modified On	Modified By
Staffing levels	3	5	27/01/2012 12:01 PM	AC	18/06/2012 5:07 PM	AC
Staffing levels not adequate at times to find time to enter data	5	8	24/01/2012 9:40 AM	AC	18/06/2012 5:07 PM	AC
Stressed by technology	2	2	21/02/2012 1:55 PM	AC	18/06/2012 5:07 PM	AC
System security	1	1	18/05/2012 12:26 PM	AC	18/06/2012 5:07 PM	AC
Computer security fort Knox	4	9	24/01/2012 9:43 AM	AC	23/05/2012 11:38 AM	AC
Password sharing to save time when locked out	7	7	24/01/2012 9:48 AM	AC	25/06/2012 3:37 PM	AC
Security of information	3	4	1/05/2012 3:16 PM	AC	25/06/2012 4:12 PM	AC
Technology pace means smart program to capture everything would be possible	1	1	12/01/2012 12:23 PM	AC	12/06/2012 11:08 AM	AC
Time entering perinatal data	6	10	23/01/2012 1:57 PM	AC	18/06/2012 5:07 PM	AC
Birth data most time consuming to enter electronically	3	4	12/01/2012 12:24 PM	AC	5/06/2012 12:22 PM	AC
Data entry time consuming	7	14	21/02/2012 1:31 PM	AC	5/06/2012 12:22 PM	AC
Entering data in advance to save time	6	10	27/01/2012 11:18 AM	AC	25/06/2012 3:25 PM	AC
Finding the time to enter the data	9	28	23/01/2012 1:39 PM	AC	25/06/2012 3:25 PM	AC
No time to enter data when very busy with women	5	8	23/01/2012 1:55 PM	AC	25/06/2012 3:27 PM	AC
Organising time to enter data to be ready for more women	2	3	21/02/2012 2:08 PM	AC	25/06/2012 3:28 PM	AC
Time spent looking for information on paper to enter electronically	5	6	12/01/2012 11:50 AM	AC	25/06/2012 3:26 PM	AC
Time taken to complete paper copy	1	1	23/01/2012 12:16 PM	AC	5/06/2012 12:22 PM	AC
Wasting time entering data for women who birth elsewhere	1	1	2/03/2012 1:04 PM	AC	5/06/2012 12:21 PM	AC
Time from event to complete data at PD increased	1	1	12/01/2012 12:38 PM	AC	18/06/2012 5:07 PM	AC
Time spent correcting or completing electronic entries	6	19	12/01/2012 12:30 PM	AC	18/06/2012 8:21 PM	AC
Using computers at home	3	4	27/01/2012 1:45 PM	AC	18/06/2012 5:07 PM	AC
Using other computer systems	12	21	23/01/2012 1:17 PM	AC	25/06/2012 3:48 PM	AC
Using PD summary for other HP's	1	1	2/05/2012 11:43 AM	AC	18/06/2012 5:07 PM	AC
Valuing the data	0	0	18/05/2012 12:17 PM	AC	18/06/2012 5:07 PM	AC
Clinician valuing the data	8	15	23/01/2012 12:28 PM	AC	24/05/2012 10:16 AM	AC
Data looking at what's going on	2	4	21/02/2012 1:23 PM	AC	18/05/2012 12:17 PM	AC
Data really important, waste of time if data not correct	5	5	12/01/2012 12:28 PM	AC	24/05/2012 11:52 AM	AC
No other staff see data as a useful tool	1	1	23/01/2012 1:30 PM	AC	18/05/2012 12:17 PM	AC
People see entering data as just a job they have to do not as a useful tool	6	11	23/01/2012 12:54 PM	AC	18/06/2012 8:43 PM	AC
Perceiving benefits for PD entry	5	6	21/02/2012 1:42 PM	AC	28/05/2012 12:39 PM	AC
Perceiving how data is used	2	2	27/01/2012 1:57 PM	AC	23/05/2012 12:42 PM	AC

‘Time entering PD’ becomes a higher order code or category with further identification of incidences and

AC 149 Items

Start Perinatal Data with tr... Document1 - Microsoft ... 7:35 PM

Grounded Theory examination of the factors that influence midwives when entering perinatal data:  
The Theory of Beneficial Engagement

Further analysis leads to grouping nodes in a different way

Name	Sources	References	Created On	Created By	Modified On	Modified By
AAADon't know where to put this data	3	4	18/06/2012 8:15 PM	AC	8/08/2012 1:34 PM	AC
Being paperless	0	0	3/07/2012 12:44 PM	AC	8/08/2012 1:34 PM	AC
Data accuracy	0	0	5/06/2012 11:53 AM	AC	8/08/2012 1:34 PM	AC
Engaging with PD	0	0	18/05/2012 12:17 PM	AC	8/08/2012 1:34 PM	AC
Extraneous influences	0	0	11/07/2012 12:13 PM	AC	8/08/2012 1:34 PM	AC
Being busy	0	0	11/07/2012 2:23 PM	AC	11/07/2012 2:23 PM	AC
Attitude to others using computers at work for non work activity	4	9	24/01/2012 11:17 AM	AC	11/07/2012 11:56 AM	AC
Being busy and having enough staff	0	0	3/07/2012 12:59 PM	AC	11/07/2012 11:56 AM	AC
Staffing levels	3	5	27/01/2012 12:01 PM	AC	3/07/2012 11:54 AM	AC
Staffing levels not adequate at times to find time to enter data	6	9	24/01/2012 9:40 AM	AC	29/07/2012 6:15 PM	AC
Management role	0	0	11/07/2012 2:53 PM	AC	11/07/2012 11:56 AM	AC
Paper priority over electronic system	0	0	29/07/2012 6:26 PM	AC	29/07/2012 6:26 PM	AC
Role of HIM not compatible with perinatal data	1	1	11/07/2012 11:56 AM	AC	11/07/2012 11:56 AM	AC
Time	0	0	11/07/2012 12:23 PM	AC	11/07/2012 12:23 PM	AC
Time entering perinatal data	6	6	11/07/2012 11:56 AM	AC	11/07/2012 11:56 AM	AC
Birth data most time consuming to enter electronically	3	3	5/06/2012 12:22 PM	AC	5/06/2012 12:22 PM	AC
Data entry time consuming	8	8	27/07/2012 12:52 PM	AC	27/07/2012 12:52 PM	AC
Entering data in advance to save time	6	6	25/06/2012 3:25 PM	AC	25/06/2012 3:25 PM	AC
Finding the time to enter the data	10	10	29/07/2012 6:19 PM	AC	29/07/2012 6:19 PM	AC
Incompletion rates perceived to be higher when unit busier	3	3	3/07/2012 2:41 PM	AC	3/07/2012 2:41 PM	AC
Interrupted by other tasks when entering data	7	7	3/07/2012 3:41 PM	AC	3/07/2012 3:41 PM	AC
No time to enter data when very busy with women	5	5	25/06/2012 3:27 PM	AC	25/06/2012 3:27 PM	AC
Organising time to enter data to be ready for more women	2	3	21/02/2012 2:08 PM	AC	25/06/2012 3:28 PM	AC
Time from event to complete data at PD increased	1	1	12/01/2012 12:38 PM	AC	3/07/2012 2:01 PM	AC
Time spent looking for information on paper to enter electro	5	7	12/01/2012 11:50 AM	AC	3/07/2012 3:18 PM	AC
Time taken to complete paper copy	1	1	23/01/2012 12:16 PM	AC	5/06/2012 12:22 PM	AC
Wasting time entering data for women who birth elsewhere	1	1	2/03/2012 1:04 PM	AC	5/06/2012 12:21 PM	AC
Time spent correcting or completing electronic entries	8	27	12/01/2012 12:30 PM	AC	29/07/2012 6:06 PM	AC
Computer distracting from care	0	0	21/02/2012 2:12 PM	AC	11/07/2012 11:56 AM	AC
Designing systems for PD entry	0	0	18/05/2012 12:23 PM	AC	11/07/2012 11:56 AM	AC

Grounded Theory examination of the factors that influence midwives when entering perinatal data:  
 The Theory of Beneficial Engagement

Copy of Refining Nodes\_7\_140313.nvp - NVivo

File Home Create External Data Analyze Explore Layout View

Go Refresh Open Properties Edit Paste Copy Merge B I U Paragraph Styles Select PDF Selection Find Find Now Clear Advanced Find

Workspace Item Clipboard Format Paragraph Styles Editing

Nodes

Look for: Search In: Nodes Find Now Clear Advanced Find

Name	Sources	References	Created On	Created By	Modified On	Modified By
Engaging with process of entering PD	0	0	18/05/2012 12:17 PM	AC	21/11/2012 1:27 PM	AC
Accountability for Data entered	3	4	28/06/2012 3:26 PM	AC	25/02/2013 4:19 PM	AC
Adapting to systems	0	0	20/11/2012 1:00 PM	---	2013 4:19 PM	AC
Data entry process	1	1	21/02/2012 2:11 PM	---	2013 4:49 PM	AC
Knowledge	0	0	5/06/2012 11:58 AM	---	2013 4:45 PM	AC
Perceiving benefits for PD entry	9	14	21/02/2012 1:42 PM	---	2013 4:19 PM	AC
Shifting focus	0	0	21/02/2012 2:12 PM	---	2013 4:27 PM	AC
Software	0	0	21/11/2012 11:01 AM	---	2013 4:47 PM	AC
Valuing the data	14	27	23/01/2012 12:28 PM	---	2013 4:19 PM	AC
Workload	0	0	11/07/2012 2:23 PM	---	2013 4:50 PM	AC
Time	0	0	11/07/2012 12:23 PM	---	2012 12:23 PM	AC
Attitude to others using computers at work for no	4	9	24/01/2012 11:17 AM	---	2012 11:56 AM	AC
Being busy and having enough staff	0	0	3/07/2012 12:59 PM	---	2012 11:56 AM	AC
Staffing levels	3	5	27/01/2012 12:01 PM	---	2012 11:10 AM	AC
Staffing levels not adequate at times to find ti	7	10	24/01/2012 9:40 AM	---	2013 2:41 PM	AC
Duplicating data	19	63	18/05/2012 11:45 AM	---	2012 11:56 AM	AC
Management role	0	0	3/07/2012 2:58 PM	---	2012 11:56 AM	AC
Paper priority over electronic system	7	11	8/03/2012 12:07 PM	AC	14/01/2013 2:41 PM	AC
Physically accessing computers for data entry	1	1	18/05/2012 12:19 PM	AC	11/12/2012 11:19 AM	AC
Role of HIM not compatible with perinatal data	1	1	23/01/2012 1:52 PM	AC	15/11/2012 1:04 PM	AC
Time entering perinatal data	6	11	23/01/2012 1:57 PM	AC	11/12/2012 11:10 AM	AC
Birth data most time consuming to enter elec	3	4	12/01/2012 12:24 PM	AC	15/11/2012 1:04 PM	AC
Data entry time consuming	8	15	21/02/2012 1:31 PM	AC	31/01/2013 5:03 PM	AC
Entering data in advance to save time	6	11	27/01/2012 11:18 AM	AC	11/12/2012 9:09 AM	AC
Finding the time to enter the data	13	36	23/01/2012 1:39 PM	AC	14/01/2013 2:41 PM	AC
Incompletion rates perceived to be higher wh	3	4	1/05/2012 9:40 AM	AC	6/11/2012 12:07 PM	AC
Interrupted by other tasks when entering dat	9	14	24/01/2012 9:41 AM	AC	30/11/2012 9:24 AM	AC
No time to enter data when very busy with w	7	10	23/01/2012 1:55 PM	AC	30/11/2012 9:24 AM	AC
Organising time to enter data to be ready for	2	3	21/02/2012 2:08 PM	AC	6/11/2012 12:07 PM	AC
Time from event to complete data at PD incr	1	1	12/01/2012 12:38 PM	AC	6/11/2012 12:00 PM	AC
Time spent looking for information on paper t	5	8	12/01/2012 11:50 AM	AC	11/12/2012 9:11 AM	AC

Finally elements emerge via theoretical coding and time becomes part of workload with some of the original nodes now sub-themes

AC 148 Items

Start Copy of Refining Node... Document1 - Microsoft ... 7:51 PM

Grounded Theory examination of the factors that influence midwives when entering perinatal data:  
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## APPENDIX E: IMAGE OF EARLY NVIVO DATA MANAGEMENT FILE

The screenshot shows the NVivo software interface for a file named 'Perinatal Data 1.nvp'. The main workspace displays a list of nodes, each with a search icon, a name, and associated metadata. The nodes are organized into a table with the following columns: Name, Sources, References, Created On, Created By, Modified On, and Modified By. The node 'Computer security fort Knox' is highlighted in blue.

Name	Sources	References	Created On	Created By	Modified On	Modified By
Accuracy of information in completed records	2	5	12/01/2012 12:27 PM	AC	23/01/2012 1:48 PM	AC
Agree that nurses lack confidence in using computers although this is reducing	1	1	23/01/2012 1:43 PM	AC	23/01/2012 1:43 PM	AC
Attitude to others using computers at work for non work activity	1	3	24/01/2012 11:17 AM	AC	24/01/2012 11:18 AM	AC
Birth data most time consuming to enter electronically	2	3	12/01/2012 12:24 PM	AC	23/01/2012 1:40 PM	AC
Care factor	2	2	12/01/2012 12:28 PM	AC	24/01/2012 2:20 PM	AC
Clinician valuing the data	2	4	23/01/2012 12:28 PM	AC	24/01/2012 2:20 PM	AC
Completion rate improving	1	1	12/01/2012 12:27 PM	AC	12/01/2012 12:27 PM	AC
computer needs to capture everything	1	1	12/01/2012 12:22 PM	AC	12/01/2012 12:22 PM	AC
Computer savyness of users	3	7	12/01/2012 12:32 PM	AC	24/01/2012 2:15 PM	AC
Computer security fort Knox	1	4	24/01/2012 9:43 AM	AC	24/01/2012 2:20 PM	AC
Computer time slow, timing out	1	9	24/01/2012 9:36 AM	AC	24/01/2012 2:20 PM	AC
Computers are the norm and that's what is going to happen	1	1	23/01/2012 1:43 PM	AC	23/01/2012 1:43 PM	AC
Computers at point of care very technical, puts focus on machinery	3	3	12/01/2012 12:19 PM	AC	24/01/2012 2:13 PM	AC
Contemporaneous notation and accurate documentation	2	3	12/01/2012 12:20 PM	AC	24/01/2012 11:15 AM	AC
Coordinator given more training	1	1	12/01/2012 12:36 PM	AC	12/01/2012 12:36 PM	AC
Copying information from paper to computer	2	3	23/01/2012 12:21 PM	AC	24/01/2012 11:12 AM	AC
Current system	3	7	12/01/2012 12:13 PM	AC	24/01/2012 9:43 AM	AC
Current system issues - no automatic save, lost data	1	2	24/01/2012 9:42 AM	AC	24/01/2012 9:49 AM	AC
Current system not suitable for point of care	1	1	12/01/2012 12:21 PM	AC	12/01/2012 12:21 PM	AC
Data only recorded on paper or electronically not both	1	1	12/01/2012 12:15 PM	AC	12/01/2012 12:15 PM	AC
Data really important, waste of time if data not correct	1	1	12/01/2012 12:28 PM	AC	12/01/2012 12:28 PM	AC
Delay in recording of information	3	9	12/01/2012 10:31 AM	AC	24/01/2012 11:13 AM	AC
Different codes and abbreviations on paper to electronic version of information	1	2	12/01/2012 11:52 AM	AC	12/01/2012 11:52 AM	AC
Duplication of data recording paper and electronic	2	5	12/01/2012 10:32 AM	AC	23/01/2012 1:36 PM	AC
Electronic system not a partogram	2	3	12/01/2012 12:21 PM	AC	24/01/2012 11:12 AM	AC
Familiarity with system speed of entry	2	3	12/01/2012 12:32 PM	AC	24/01/2012 9:47 AM	AC
Fear of new system	2	3	23/01/2012 12:27 PM	AC	24/01/2012 11:18 AM	AC
Finding the time to enter the data	2	14	23/01/2012 1:39 PM	AC	24/01/2012 11:07 AM	AC
Frustration with current system	1	3	24/01/2012 2:19 PM	AC	24/01/2012 2:21 PM	AC
Frustration with dealign with error reports	1	1	24/01/2012 2:22 PM	AC	24/01/2012 2:22 PM	AC
Hands wet, gloves on unable to use pen at time of event	2	2	12/01/2012 12:17 PM	AC	23/01/2012 12:25 PM	AC
Improve completion rate via training, naggin, generic emails	1	2	12/01/2012 12:37 PM	AC	12/01/2012 12:37 PM	AC
Improved validation results	1	2	12/01/2012 12:29 PM	AC	12/01/2012 12:29 PM	AC

Grounded Theory examination of the factors that influence midwives when entering perinatal data:  
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## APPENDIX F: ETHICS APPROVAL LETTER



INITIAL APPLICATION APPROVAL -Transfer  
In reply please quote: HE12/112  
Further Enquiries Phone: 4221 3386

28 May 2012

Ms Alison Craswell  
c/o CQ University  
PO Box 1128  
NOOSAVILLE QLD 4566

Dear Ms Craswell,

I am pleased to advise that the application below has been approved.

Ethics Number: HE12/112  
Project Title: What influences registered nurses and midwives when collecting and entering perinatal data?  
Researchers: Ms Alison Craswell, Professor Lorna Moxham, Mr Marc Broadbent, Dr Moira Williamson  
Approval Date: 5 April 2012  
Expiry Date: 4 April 2013

The University of Wollongong/ISLHD Health and Medical HREC has noted the previous Central Queensland University Human Research Ethics Committee approval (Project H11/10-156) and the transfer of the research to University of Wollongong.

The University of Wollongong/ISLHD Health and Medical HREC is constituted and functions in accordance with the NHMRC *National Statement on Ethical Conduct in Human Research*. The HREC has reviewed the research proposal for compliance with the *National Statement* and approval of this project is conditional upon your continuing compliance with this document.

A condition of approval by the HREC is the submission of a progress report annually and a final report on completion of your project. The progress report template is available at <http://www.uow.edu.au/research/rso/ethics/UOW009385.html>. This report must be completed, signed by the appropriate Head of School and returned to the Research Services Office prior to the expiry date.

As evidence of continuing compliance, the Human Research Ethics Committee also requires that researchers immediately report:

- proposed changes to the protocol including changes to investigators involved
- serious or unexpected adverse effects on participants
- unforeseen events that might affect continued ethical acceptability of the project.

Please note that approvals are granted for a twelve month period. Further extension will be considered on receipt of a progress report prior to expiry date.

Research Services Office University of Wollongong NSW 2522 Australia  
Telephone: +61 2 4221 3386 Facsimile: +61 2 4221 4338  
[research-services@uow.edu.au](mailto:research-services@uow.edu.au) [www.uow.edu.au/research](http://www.uow.edu.au/research)

If you have any queries regarding the HREC review process, please contact the Ethics Unit on phone 4221 3386 or email [rso-ethics@uow.edu.au](mailto:rso-ethics@uow.edu.au).

Yours sincerely,

A handwritten signature in cursive script, appearing to read "Sarah Ferber".

Associate Professor Sarah Ferber  
Chair, UOW & ISLHD Health and Medical  
Human Research Ethics Committee

cc: Professor Lorna Moxham  
School of Nursing, Midwifery and Indigenous Health

## APPENDIX G: PARTICIPANT INFORMATION SHEET AND CONSENT



### **What influences registered nurses and midwives when collecting and entering perinatal data?**

#### PARTICIPANT INFORMATION SHEET

This research project aims to understand the factors that influence registered nurses and midwives when collecting and entering perinatal data. The purpose is to gather information from you, a user of any system for collection of perinatal data, to find out in your words what happens between the bedside and the computer in the process of collecting and entering perinatal data.

The significance of this project is that collection of perinatal data historically has occurred via a paper form. It has migrated online without assessment of how that impacts on the users. This research will provide you, a user of a system for perinatal data collection an opportunity to say what you think about it.

#### Requirements of you the participant:

As a participant in this research project, you will be required to be available for an interview of about an hour at a place and time of your choosing outside of your work place and working hours. You can participate in your interview by phone if you like, or face to face with the researcher if time and distance permits. At a later date I may need to contact you again to clarify some of the information you have provided but this second interview would take no more than 30 minutes. The interview will provide you with time to say anything you feel is important about your experiences with perinatal data collection. In choosing to participate, your employment will not be affected in any way, as I am interested in your experiences and perspectives as they relate to you as a person who uses a computer to enter perinatal data, not as

an employee of a particular organisation. Your participation is confidential.

#### Benefits and Risks

The benefit to you for participating in this research is the opportunity to speak in your own words about your process in collecting and entering perinatal data. Your information together with information from other participants will provide a unique insight into a users perception of the process and system for perinatal data collection. This information will be aggregated into a theory, which has the potential to alter the way you collect and enter perinatal data for the better.

This will in turn benefit the community by providing a more functional and accurate system of perinatal data collection and therefore more valid data outputs for funding and research purposes.

It is not envisaged there will be any risk to you for your participation.

In the unlikely event of negative outcomes or experiences, contact details for the university can be found below.

#### Confidentiality / Anonymity

Your confidentiality and anonymity will be maintained by de-identification of your data after interview. Only myself as the principal researcher will have your name and contact details. These will not be part of the recorded interview. The interview recording will be assigned a number and sent to a transcriber. All copies of the transcribed interview will only be identifiable by that number. No information on your place of work, your age or other personal details will be recorded. The only relevant personal data that I will be aware of will be the eligibility criteria, which have already been assessed to get to this point. That is that you are a RN, Midwife, Health Information Manager or perinatal data coordinator who uses a computer to collect, enter or manage perinatal data and used your system for perinatal data collection for 12 months or more.

All data for this project will be securely stored for 5 years following the final publication from the project in accordance with the University of Wollongong policy. After this time, recorded files will be deleted and any printouts will be shredded.

#### Findings of this project

The findings of this research will form the basis of my thesis to meet requirements for PhD.

Over the course of this project, I will present findings at conferences and publish them in journals. At the end of the project, should you wish, I can send you a copy of the findings in plain English. A space for your preferred email contact is on the consent form.

#### Consent

You will be required to complete and sign a consent form supplied with this information sheet. Please read it carefully and ask me any questions you have before signing it.

#### Withdrawal from the research

You have the right to withdraw from this research at any time without penalty. Should you withdraw prior to data analysis, your interview file will be deleted and any transcripts made will be shredded. Should you withdraw after data analysis has begun, withdrawal of your specific data cannot be guaranteed due to the nature of how it is analysed. However, should you withdraw after this time, no reference to any actual words or statements you have made during your interview will be made in any document or presentation of the findings.

Any questions? Please contact me!

Researcher contact details: Alison Craswell  
aje558@uowmail.edu.au  
07 5440 7041

Supervisor contact details: Prof Lorna Moxham  
[l.moxham@uow.edu.au](mailto:l.moxham@uow.edu.au)  
02 4239 2559

Any concerns or complaints?

Should there be any concerns about the nature and/or conduct of this research project, please contact:

University of Wollongong Research Services Office:

Tel: 02 4221 3386;

E-mail: [research-services@uow.edu.au](mailto:research-services@uow.edu.au)

Mailing address: Research Services Office

Building 20, Level 1

University of Wollongong,

Northfields Ave

Wollongong NSW 2522

UOW Ethics approval: HE12/112

## What influences registered nurses and midwives when collecting and entering perinatal data?

### CONSENT FORM

I \_\_\_\_\_ consent to participate in this research project and agree that:

1. An Information Sheet has been provided to me that I have read and I understand its contents.
2. I have had any questions I had about the project answered to my satisfaction by the Information Sheet and any further verbal explanation provided.
3. I understand that my participation or non-participation in the research project will not affect my employment.
4. I understand that I have the right to withdraw from the project at any time without penalty.
5. I understand that if I withdraw after the point of commencement of data analysis, not all the information I have provided can be withdrawn.
6. I understand the research findings will be included in the researcher's publication(s) on the project and this may include conferences and articles written for journals and other methods of dissemination stated in the Information Sheet.
7. I understand that to preserve anonymity and maintain confidentiality of participants that no data will be identified as belonging to any participant.
8. I am aware that a Plain English statement of results will be available to me should I provide contact postal or email address below.
9. I agree that I am providing informed consent to participate in this project.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Name (please print):

\_\_\_\_\_

E-mail Address:

\_\_\_\_\_

I wish to have a Plain English statement of results posted to me at the email address I have provided. YES/NO

University of Wollongong/ISLHD Health and Medical HREC clearance number: HE12/112

**APPENDIX H: SCREEN IMAGE OF ONLINE PERINATAL DATA FORM UTILISED IN QUEENSLAND HEALTH**

**QUEENSLAND PERINATAL DATA COLLECTION PORTAL**



 USER: [redacted]    Change Password    Lo  
 Version: v3.0.9    Production

**Baby Details Screens**

1. Labour and Delivery
2. Baby Birth Details
3. **Postnatal and Discharge Details**

---

**Post Natal Details**

Did the baby have any Neonatal Morbidities?

Did the baby have any Neonatal Treatment?

Was Baby admitted to ICN/SCN? Yes

ICN  days

SCN  days

Reason for Admission to ICN/SCN

Low birth weight, Birth weight 1500-2499g

Does the newborn have a Congenital Anomaly?

**Baby**

Mother's Name:

Baby's UR No.

Date of Birth:

Change Baby  Id:

---

**Baby Discharge**

Neonatal Screening date

Discharge Weight  grams

Baby Discharge Date

Separation Type

Did the baby receive any fluid at any time from birth to discharge?

Did the baby receive any fluid 24hr prior to discharge?

Did the baby receive any alternative feeding method?

**Mother Discharge Report**

Did the mother have any Puerperium Complications?

Did the mother have any Puerperium Procedures?

Discharge Status	9
Transferred To	
Discharge Date	
Early Discharge Program Code	

**APPENDIX I: FIELD DEFINITION EXAMPLE FROM QUEENSLAND HEALTH  
ONLINE PERINATAL DATA FORM MANUAL: “CURRENT MEDICAL  
CONDITIONS” (DATA COLLECTIONS UNIT, 2010).**

**6.7 CURRENT MEDICAL CONDITIONS**

<b>CURRENT MEDICAL CONDITIONS</b>	
You may tick more than one box	
None	<input type="checkbox"/>
Essential hypertension	<input type="checkbox"/>
Pre-existing diabetes mellitus	<input type="checkbox"/>
• insulin treated	<input type="checkbox"/>
• oral hypoglycaemic therapy	<input type="checkbox"/>
• other	<input type="checkbox"/>
Asthma (treated during this pregnancy)	<input type="checkbox"/>
Epilepsy	<input type="checkbox"/>
Genital herpes (active during this pregnancy)	<input type="checkbox"/>
Anaemia	<input type="checkbox"/>
Renal condition (specify) _____	<input type="checkbox"/>
Cardiac condition (specify) _____	<input type="checkbox"/>
Other (specify) _____	<input type="checkbox"/>

Tick the box(es) that correspond to any medical conditions the mother has which may significantly affect the current pregnancy or its management, or document the condition(s) in the space provided (see Appendix D for examples). If the mother has no current medical conditions, tick 'None'. Where 'Renal condition', 'Cardiac condition' or 'Other' is ticked, please provide as much detail as possible to allow an appropriate morbidity code to be assigned. For example rather than report 'Hepatitis', the type and infection status is required, i.e. Acute or Chronic Hepatitis B/C or Carrier of Hepatitis B/C.

**Definition:**

- Current medical conditions**  
 Includes pre-existing maternal conditions, hypertension or diabetes, and other diseases, illnesses or conditions arising during the current pregnancy, that are not directly attributable to pregnancy but may significantly affect care during the current pregnancy and/or pregnancy outcome.
- Pre-existing diabetes mellitus**  
 Diabetes pre-existing prior to pregnancy. Indicate whether insulin treated, oral hypoglycaemic therapy treated or other (includes diet, exercise, lifestyle management).