

O&SB2010 "Open and Sustainable Building" – Chica, Elguezabal, Meno & Amundarain (Eds.)

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OPEN BUILDING FOR A KALEIDOSCOPE OF CARE: A NEW CONCEPTUAL APPROACH TO OPEN SCENARIO PLANNING

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ABSTRACT

Open scenario planning, in a market such as healthcare infrastructure where change at every scale is inevitable, provides a significant opportunity. Healthcare, which comprises a complex mix of people, technology, buildings and other forms of infrastructure, is facing huge pressures. As such healthcare trusts are looking to make better use of resources; decrease carbon emissions; and re-think how they can act in a more sustainable and integrated way. Within the UK National Health Service, "taking care closer to home" and "saving carbon, improving health" are two of a number of Department of Health (DH) initiatives to improve healthcare and respond to the need for sustainable, accessible, efficient and effective services. Furthermore these are also the drivers for integration between health, social care, local authority, independent and third sector providers which is creating blurring between spatial scales and roles. Against this backdrop it is not surprising that the effective life span of buildings is continuing to shorten, which is significant in a sector that has infrastructure that is one of the most expensive to operate, maintain and replace. As such the notion of "change ready" is key. This paper through a state-of-the-art literature review introduces and explores the potential and conceptual linkage between infrastructure, capacity and scalability within open building and planning extending (Astley, 2009; Kendall, 2009). The authors' collaborative and action research has contributed to the development of a new approach and this research has identified the need for a flexible, dynamic and scenario based approach to planning that goes beyond estates strategy and beyond master planning and which precedes open building. The diversity of care pathways across a changing healthcare planning environments is demonstrated using a case study review, which raises the importance of a hierarchy of decision making, principles and process within an open planning approach. This paper further provides a review of existing business case development processes and capacity planning tools that are prevalent in healthcare strategic planning and operations management, but not so in adaptability research. Scalability as a concept that can bridge the healthcare and estates infrastructure domains is also introduced.

Keywords: Care Model, Health, Open, Planning, Scenario,.

INTRODUCTION

Adaptability for growth and change in healthcare design of the twentieth century has a long history; specifically in the organisation of functional relationships between hospital departments and principles of standardised space. However, an Open Scenario Planning (OPS) approach is being proposed to respond to new thinking in service delivery and for a flexible, optimised, use of facilities in healthcare and across the spectrum of care (Astley, 2009). All too often schemes can gain momentum and develop, be designed or constructed at scales that are outmoded and inappropriate, when judged against existing healthcare demand, innovation and distribution. The authors are working to devise a more strategic and integrated approach to OPS, addressing the need for better description of scales, typologies and 'rules of thumb' for an estates response that fits with a health Trust's business objective and inform strategic board decision making and aids the development of integrated and sustainable healthcare solutions that appropriately distribute expertise and technology to deliver the highest quality care.

This principle of organising healthcare services for large areas according to distance, scale and level of specialism is an issue that has not been discussed in open building, however it has been described as part of office developments. Nor has the need for integrating care service, estates and transport infrastructure expertise into the planning process to ensure the delivery of sustainable, accessible and world class healthcare services been given enough of a priority. As such, this paper argues that open building (that relates to the spatial and technical building), must be preceded with strategic, open, dynamic and scenario based organisational and programme discussions about business functioning, location and distribution that will inform project level "base build" specifications and design briefing. It also highlights the need to consider open-building stakeholder decision-making levels and processes in more sector and organisation specific terms. Traditionally within the healthcare sector, the focus on adaptability and flexibility has been on technical building qualities and procurement, rather than on the integration of stakeholder infrastructure perspectives to deliver an optimum whole system solution. This work starts to outline this need and the shape of the authors' ongoing work based on the following existing flexibility and healthcare concepts:

- **Open Building.** An emerging and ongoing dynamic and systematic approach to organising decision making and construction that technically and spatially separates building levels. Designing open buildings is the creation of a loose fit relationship between the base architecture and its changing fit-out according to Kendall (2007); in a way that supports stability, change and constant environmental transformation (Kendall, 2009).
- **Care Model.** A care model is an evidence-based, safe and efficient procedure made up of care elements, pathways and protocols that structure a patient journey (DH, 2010). As such it defines the scale, distribution and quality of the infrastructure that supports integrated health and social care and defines workforce roles, technologies, IT, finance, information and estates (DH, 2010).
- **Capacity.** Is a whole system healthcare planning approach that involves regulators, commissioners and providers coming to an agreement on how resources should be distributed and capital invested in expensive equipment and built infrastructure (in terms of bed numbers, floor area or a service specification).

In addition to these concepts, this paper aims to raise the importance of the following concepts alongside open building in a healthcare context:

- **Healthcare Infrastructure.** The basic, physical underlying structure of productive healthcare operations. It is a high cost investment or asset that supports and sustains functioning at various scales in order that they can be effective and efficient.

Infrastructure coincides with regulator, commissioner and provider organisations/partners that have systems of care, estates, transport, technology and staff.

- **Open Infrastructure.** Building planning and design is nested within a broader system of infrastructure. Taking health as an example this system integrates technologies, workforce and transport systems that can all have a significant impact on the changing roles and functions of buildings.
- **Open Scenario Planning.** A dynamic multi-stakeholder and multi-level planning approach to integrating care, estates and transport infrastructure systems through a robust process of gathering data, modelling and value review. This approach defines and integrates systems and scales to achieve flexible, scaleable, efficient and productive healthcare infrastructure.
- **Scalability.** Is a desirable property of a infrastructure system, a network or process whereby infrastructure can be adapted by adding resources and growing or shrinking capacity while concurrently improving quality and performance

Figure 1. combines these concepts and demonstrates the focus of this paper on developing an integrated approach to open infrastructure planning which the authors have termed (Open Scenario Planning or OSP) that aligns with the existing healthcare business case development process. Further it demonstrates the need for Open Building to emerge out of a broader planning framework than the present state-of-the-art would suggest. Figure 1. further positions three of the concepts of OSP, two of which this paper explores. These include the importance of gathering baseline capacity and modelling various scenarios to understand infrastructure scalability and to evaluate value from various stakeholder perspectives and against different value criteria. The later is a subject that is discussed by the authors in other publications.

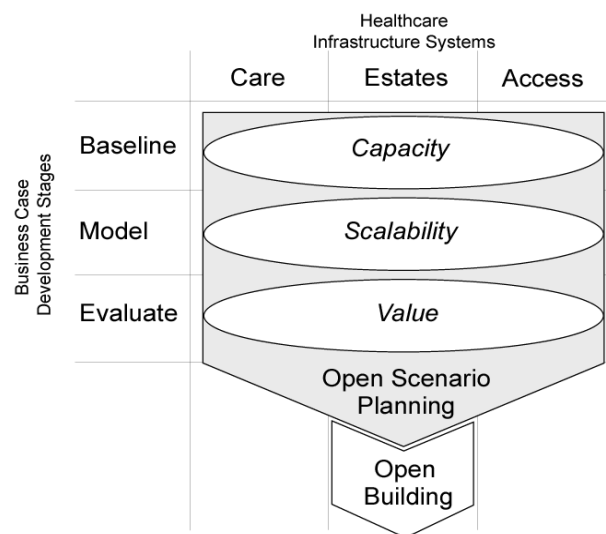


Figure 1. Open Scenario Planning Framework

THE NHS KALEIDOSCOPE OF CARE

This section describes the dynamic nature of healthcare planning and design and the problem that “open building” must address. It also identifies the need for a new approach to open scenario planning and raises the importance of scalability as an importance adaptability strategy. The phrase Kaleidoscope of care was first coined by Kember and Macpherson (1994) to explain the shifting structure, movement of funding, changing market and re-organisation that has contributed to: changes in the NHS from

centralised to de-centralised and back; and the need for increased infrastructure adaptability and evidence to address the impacts of policy, technology, economy and environment on healthcare outcomes.

Regional care systems all over the country have been affected by changes in population, demographics, healthcare needs, politics (national and local), public and clinical pressure and the development of medical science, education, diagnostics and disease treatment and management. The increasing ability of doctors to treat illnesses has increased the demand for and capacity of services and led to an escalation in whole system cost. The development of specialisation has led to scales of advanced treatment and care delivered at various scales from treatment centres to hospital departments – while technologies distributed these into community scales. According to Rivett (1986) advances in bacteriology, biochemistry, physiology and radiology created the need for laboratory accommodation and service departments, so that hospitals no longer consisted merely of an operating theatre and a series of wards. Furthermore, “sub-specialisation ultimately meant that services had to be organised on a regional basis and the reputation of clinicians determined demand”. A situation that still persists today. Thinking about the systematic organisation and optimisation of care for a given population at a regional or district scale, has a long history. Dawson (1969) suggested a hierarchical system for planning with simple and complex scales that would require new patterns of medical administration, to ensure “unity of purpose at all levels”. According to Rivett (1986) organising hospital services on a district basis should be accredited to Dawson, who identified the importance of planning against a population need – an issue that has not been strongly articulated in adaptable building literature today. What is needed is a framework that defines how capacity can meet demand (given the number of cases, speciality of treatment and size of the catchment population).

In recent years a number of DH policies and initiatives have strongly emphasised the need to shift healthcare towards local community settings, closer to patients’ homes DH (2006); Darzi (2007) and Darzi (2008) and prioritises specific care pathways. In 2006, a series of 30 demonstration sites were selected in six specialties: Dermatology, Ear Nose and Throat (ENT), General Surgery, Gynaecology, Orthopaedics and Urology (Leese, Michele Bohan et al. 2007). Care models for these six are being further explored in the UK (DH 2010). Table 1. shows the diversity in location of care across exemplar trusts for these six speciality areas. The implications of this is that open building must accommodate these changing service locations and scales if they are to optimise flexibility, adaptability and capacity.

	Dermatology	ENT	General Surgery	Gynaecology	Orthopaedics	Urology
Home		Ipswich	Newcastle	Winchester Hartlepool		Nottingham Newcastle
Health and Social	Hull and East Yorkshire	Leicestershire	Cornwall		Kingston	
Community	Middlesbrough Camden	Bradford Cornwell Rotherham	Leicestershire	Manchester Newcastle Norwich	Oldham	Southampton Essex Bradford Edgware
Specialist		Ipswich	Epsom Newcastle	Hartlepool	Camden Middlesbrough	

Table 1. Diversity of Care Pathway Locations Across 30 NHS Demonstration Site

LITERATURE ON OPEN BUILDING AND ADAPTABILITY

Kendall (2007) positions open building as a new emerging research area within healthcare construction and identifies the need in this field for new theory that goes beyond technical building methods. The central premise of Kendall (2007) is the need for a loose-fit relationship between the base architecture and its changing fit-out, which he demonstrates using a three tier system and design team separation as an approach. Further Kendall (2007) defines the need for scenario planning at a building scale. However does not highlight the need for scenario planning at a higher fabric or infrastructure scale. Cuperus(2001) identified the conceptual relationship between open building and lean construction which are both to deliver value and reduce waste. Cuperus(2001) further defines a number of levels of decision making and urban scales. However has not taken a sector specific view of how infrastructures are shaped by organisations. This paper introduces infrastructure open scenario planning and scalability as important concepts alongside open building.

Chefurka and Nesdaoly(2009) describes the need for the consideration of hospital flexibility throughout planning, design, construction and post-occupancy phases. Within these Chefurka and Nesdaoly (2009) highlight strategic planning, master planning and functional programming amongst others. Within this framework, functional programming (which includes equipment choices, service consolidation, standardisation and modularisation) is similar to traditional views of flexibility. Whilst master planning, which includes for Chefurka and Nesdaoly (2009) the planning horizon, building and site size and type and service growth and change is most closely related to the approach presented in this paper. However as Astley (2009) discusses there is a need to go

beyond this to develop new integrated infrastructure scenario planning approaches and tools that go beyond traditional prescriptive master planning and which generates a plan that 'plugs' into existing infrastructure at appropriate levels and allows any future building 'module' to be tested for a range of options and a prioritised range of different scenarios of use. A technique to facilitate a dynamic business model (Astley, 2009).

Within the adaptability literature, the term scalability includes extendable, expandable, upgradeable, elasticity, redundancy and shrinkable according to Schmidt, Eguchi; et al. (2009). Of the authors they cite, Blakstad (2001) has perhaps the most relevancy to this work. Blakstad (2001) takes a strategic approach to adaptability looking at the user and building interface and identifies "extendibility" along side "partitionable" and "multi-functional". Further the importance of value in relation to future adaptation versus the cost of adaptation is also raised. Related to scalability is the concept of capacity which is not prominent within the adaptability literature, which is particularly significant in the healthcare field. Capacity within open building relates to the measure of quality in the base build to accommodate a range of variations in floor plan and use within the constraints of the given base build, or the degree of freedom provided by a higher or lower level of system separation. This definition of capacity is expanded within this article to include the discussion of regional or whole-system capacity, outside of that defined by a building and across infrastructure.

METHOD

This paper is a part of ongoing research into healthcare open scenario planning, strategic asset management and master planning. These areas were highlighted as significantly important by healthcare sector practitioners during three initial steering group workshops with industry as part of the Health and Care Research and Innovation Centre (HaCIRIC) EPSRC funding programme. The first was a DH Estates and Facilities strategic direction meeting (n=12), where "n" is the number of participants, and the second and third were peer review processes (n=15) and (n=9), that included representatives from industry a policy think tank and academia. Once the direction for the work was established a collaborative initiative and programme of workshops was delivered that included the Department of Health, The Prince's Foundation, HaCIRIC, MARU and HUDU. This paper draws on multi-stakeholder decision making process and tool reviews that were completed as part of this work and a series of five workshops with an expert sample of DH, NHS and other institutional and academic representatives. Attendance at workshops varied between (n=5) and (n=20). These workshops led to the development of a new approach to Planning Healthcare Infrastructure that aimed to integrate care, estates and transport planning through a process of gathering baseline data, modeling scenarios and reviewing the value of proposals. This method has subsequently been tested in two live case studies and compared to observations carried out in a third, however this work is not described here. This paper combines these applied research and development workshops with a broad and shallow literature review of open building, adaptability and healthcare service and capacity planning. However, a deeper and more detailed literature review is required to rigorously confirm the findings and gaps in the literature and theory of open building.

THE EXISTING HEALTHCARE PLANNING PROCESS

If OSP and Open Building are to be successful within the healthcare sector it must be understood alongside existing infrastructure business case development and change and innovation processes. These processes have been mapped in Table 2. against the

planning healthcare infrastructure process (top line) developed by the authors (and also shown in Figure 1).

Baseline Case for Change		Model Scenarios		Review Proposals		(PHI 2009)
Priorities Need	Plan	Review Current State	Design Future State	Implement Service Change	Transition and Monitor	(DH 2009)
Baseline Information	Fitness for Purpose	Finance			(CHP CIAMS 2009)	
Strategic Context: A Case For Change	Make	Outline Business Case: (a range of scenario) Options	identify	Full Business Case: Assess and Plan the preferred Options in Detail		(NHS Executive 1994)
Baseline	Query and Analysis	Analytical Modelling	Forecast-ing			(HUDU 2006)
Understand and Reframe	Develop Concepts		Test and Learn	Design Delivery and	(NHSIII 2010)	

Table 2: NHS Infrastructure Business Case Development Processes

Healthcare infrastructure planning is by nature a complex interaction of factors that determine the distribution of resources. These factors in the planning process are interrelated and interdependent and as such the delivery of an efficient and effective proposal is often dependent on an iterative and multi-stakeholder information and coordination decision making process that emerges at the correct level of generality. As such, the definition of demand and capacity is problematic and locality specific demographic need, divergent care pathways and different infrastructure (technologies, workforce and buildings) are difficult to account for in Open Building. What is more the power and influence of various healthcare regulator, commissioner, provider and customer stakeholders is unequal and changing during the business case planning and building design process (Mills, Price et al. 2009). In order to deal with this complexity, Trusts often employ external healthcare planners who can assume a responsibility for gathering baseline data and generating options. However, there are few fully integrated infrastructure planning approaches to do this. Some will employ both estates healthcare planners and care service planners; however, few Trusts will employ transport specialists, rather hoping that local authorities will assume these roles. As such, approaches and starting points to healthcare planning vary hugely as well as the level of specialist and technical detail used to address the infrastructure planning process. Thus, what is needed for all healthcare planners and decision makers is a common multi-disciplinary workshop driven by common integrating principles.

THE EXISTING HEALTHCARE CAPACITY PLANNING TOOLS

Capacity planning is well understood as a crucial component of health care governance that is used by most countries. It often involves central, regional and legal authorities, with tiered responsibility and approval mechanisms. The outcome of capacity planning is often a capital investment strategy that identifies expensive equipment, number of

developments, bed capacity and a service specification (Ettelt, Nolte; et al. 2008). However how these broad capacity figures are translated into building design is less well understood, not alone used to plan or design for adaptability. This paper raises the importance of developing methods and tools that link capacity and strategic open scenario planning. What is needed is a more integrated approach with estates planning actively informing new service re-design, rather than what often happens which is responsive and retrospective fitting service capacity into existing and new buildings, with staff having to make do, rather than customising infrastructure systems to be truly fit for purpose. Capacity planning is used to determine the demand of services along with the required capital investment planning (for healthcare facilities and technologies) and adequate staffing requirements. However this is often a complex and dynamic process where site specific characteristics such as patient management profiles, structural, political, geographical and organisational environments can play a large role (Nguyen, Six et al. 2005). Capacity Planning consists of: modelling the demand for services along with changing care pathways, modelling the available capacity, identifying appropriate settings for healthcare delivery, determining activities and the sourcing requirements along with the affordability of the services (Green, 2004; Huddy and Jon, 2002; Nguyen, Six et al. 2005; Nguyen, Six et al. 2007; Exadaktylos et al. 2008a; Exadaktylos et al 2008b). Table 3. describes some of the existing care, estates and access infrastructure capacity planning tools and where they are applied in the business case development process defined by the authors (as in Figure 1. and Table 2.).

Table 3. Healthcare Capacity Planning Approaches

Tool	Structural Content			Infrastructure			Business Development Stage			Case	Method Description
	A Care	B Estates	C Trans	1 Base Data	2 Model	3 Review					
HUDU Model	1			1			1				A web based benchmarking tool to aid planning. It presents predicted bed and area capacity against future housing, population and demographic needs that allow for comparison between Trusts on healthcare demand.
SHAPE	1	1	1	1							Web based benchmarking tool that combines cost, hospital episode/activity, ERIC, Estates KPIs, demographics, prevalence and GIS time travel data. This tool does not include any definition of bed, room or building capacity.
Dr Foster	1			1					1		Web based benchmarking tool that contains clinical data. It provides data on avoidable admissions and provides benchmark data on local demographics, health needs, prevalence and geographical referrals.
Systems Dynamics (e.g. Simul8)	1	1	1				1				A non-sector specific software that aids in the design of care pathways and is used to demonstrate capacity, bottle necks and schedule resources.
Scenario Generator	1						1	1			A web based and care pathway design tool that is supported by clinical activity data. It aids demand and capacity planning through the demonstration of changing population, prevalence, flow, delays and waits across the whole care system
GIS				1				1			This approach is web based and a specialist programme. It can be used to spatially map population and healthcare distribution at various scales and demonstrate how capacity is responding to demand, accessibility and equitability parameters.
CIAMS		1					1				An approach and process to collecting benchmark data on trust estates quality, use, location, cost and its potential to meet existing and future demand.

Estates Capacity Planning	1			1				Site specific activity data or service specifications are translated into building departments, spaces or number of beds and costed. More advanced approaches translate this activity into utilisation targets and space use timetables.
EstatesCODE	1			1				An approach to establishing a buildings physical condition, functional suitability, quality and space utilisation. Its concentration is on establishing existing building use data, is not directly related to clinical specialist areas, nor does it take a future scenario based look at technological and clinical change.
Strategic Service Development Plan (SSDP)	1	1			1			A principle and business case document that sets out the link between health and social outcomes and infrastructure development. It aims to sit across the range of services and settings, however is often a service specification for a specific site. It sets out the expected 10 year demand for services based on demographic, technology and clinical changes. Prescriptive specification rather than scenario based.
Open Scenario Planning	1	1	1	1	1	1	1	A dynamic multi-stakeholder and multi-level planning approach to integrating care, estates and transport systems through a robust process of gathering data, modelling and value review. This approach defines and integrates systems and scales to achieve flexible, scaleable, efficient and productive healthcare infrastructure.

Traditional estates capacity planning approaches see the translation of activity data (Hospital Episode Statistics HES in the NHS) into building departments, spaces or number of beds. More advanced approaches translate this activity into utilisation targets and room use timetables. However, estates capacity planning approaches are often only as good as the care activity models that support them. These types of approaches can cover up a number of assumptions about where and how diagnostic, treatment and rehabilitation is carried out in the building and the actual care pathway that patients take within and between buildings and rooms. Further estates planning tools may not allow on their own open planning – they must be integrated with other clinical and transport based approaches.

Table 3. shows that capacity planning tools often take a single perspective and do not incorporate all aspects of a structural infrastructure change (HUDU, Scenario Generator, CIAMS, EstatesCODE, and Estates Capacity Planning). Further that some approaches do not facilitate a broad strategic and open discussion of how data is modelled or evaluated, while others provide no data at all and rely on the experience and skills of practitioners. OSP aims to address this need for an approach that integrates all structural changes (starting with care model design) through a process of data capture, scenario development and review. Existing capacity planning tools have little definition of scale and as such often measure capacity within a healthcare sub-system, without reference to what impact a capacity change will have on another part of that same system. This work raises the importance of defining change scenarios that are supported by data and can be evaluated from the perspective of the whole system, so that broader impacts can be understood. Further, existing capacity planning approaches can sometimes require disproportionate input of resources for the clinical benefits received. From a care service redesign perspective there are wasted clinical visits for tests results not yet back, operation deferral, missed appointments, overlapping treatments, incorrect referral or inappropriate system entry and step down. From an estates perspective these will result in poor space utilisation and space redundancy, lack of sharing and space duplication. What is needed is a scenario based approach to planning that occurs before the building is commissioned or designed. This approach to

capacity planning will require a more radical look at the care system that will provide for a more strategic and regional approach to open and change ready infrastructure. In so doing these new capacity planning tools must be built around: 1) Prevention, 2) Supported self-care, 3) Lean pathways, 4) A choice of low carbon treatment alternatives, 5) A distributed care supply model to meet patient needs and demands, 6) Innovative technologies that support remote and distributed care, 7) Efficient and effective out-patient and day-case referral management and patient experience. Ensuring patients get access to the correct care first time is critical in ensuring quality, and 8) Efficient and effective step-up and step-down management and patient experience (Health and Sustainability Network and Climate and Health Council, 2010).

An interesting concept that is starting to emerge in the technology, IT and innovation diffusion domain is scalability. This is further explored here as a potential concept that both adaptability and healthcare planning academics and practitioners can support. Systems of healthcare infrastructure are never static, and as such scalability (as a measure of how a system can be changed) is an important factor. Scalability as a concept in building design is an issue that has not been researched, but it has fundamental implications for whole system demand and capacity planning. It is how an infrastructure or infrastructures (care, estates, transport), or a part of can handle growing or shrinking capacity, increasing or decreasing demand or can be readily enlarged or shrunk without impacting the performance or value of that system. It can refer to the capability of a system to increase total throughput under an increased pressure when resources are added or removed, but more specifically a scaleable system improves performance in line or proportionately with an increase in resources or capacity over the whole system. Further, if the performance or quality of a system is reduced or fails, then the improvement is not sufficiently scaleable. The term is also used in a commercial context when a company's underlying business model offers the potential for economic growth. Its importance is that it could lead to: 1) Optimisation of capacity within and between layers of the system, against various resource scales and overhead minimisation, 2) Greater infrastructure utilisation (building, technology and staff), 3) Improved whole system capacity planning and increased resilience and adaptability, 4) Integration and less complication within and between scales, and 5) Fewer network complications, delays, expenses. However these scalability benefits require further testing.

DISCUSSION

The introduction and position of the terms infrastructure, capacity, scalability and open scenario planning has been discussed within this paper. Brand (1995) and Kendall (2007) detail the importance of scenario planning at the building scale, however scenario planning on a regional and neighbourhood fabric scale, across infrastructure is not addressed. Astley (2009) first discussed the use of a flexible scenario based approach, which is expanded by this paper. The introduction of OSP will be explored by the authors so that changes in clinical care service or logistics, that have a direct impact on a buildings and business function, can be more clearly expressed within or alongside the theory of open building. This paper expands Cuperus (2001) and Kendall (2007) definitions of open building and decision making through its introduction of "infrastructure", which might in open building be referred to as the 'grain'. As such it is hoped that this work will broaden the defining system of open building from that of the building to a wider consideration of the urban fabric, workforce, technologies and other systems, networks and processes that make up a complex sector such as healthcare. This paper references the work of the authors in establishing a decision making framework and definition of nested scales that allow system separation across

healthcare infrastructure. This paper and the future work of the authors will describe the critical concepts and approach taken in healthcare infrastructure planning.

The use of capacity as a term is limited to the building scale within existing approaches to open building, this paper has expanded the consideration of capacity across a whole healthcare system, and the importance of redefining approaches to capacity analysis in open infrastructure planning through national, regional, city, community and building scales. Future research by the authors will need to investigate the influence and freedom that such an approach will have on open building and open buildings impact back on the whole healthcare system (including care, estates and transport). There are a number of capacity planning tools (based on target ratios and scenario based predictive modelling and simulation) that need to be introduced and integrated with estates business case development and strategic decision making to evaluate complex health systems along with testing various care models. This paper has demonstrated this need through a desk based review that will require further validation with industry. The OSP approach is a marked difference to existing open building and capacity planning approaches and breaks away from estates strategy adherence to legislative and process procedures, technocracy and comprehensiveness, fixed land-use zoning, and land development control. The traditional design approach is manifest in rigid (master) plans, unresponsive to market drivers and expensive for Trusts in preparation and implementation (Astley, 2009). In short, current economic conditions of reduced capital spend, changes in commissioning patterns and insufficient analytical tools are require new techniques for Trusts and their partners to appraise both the legacy of their existing estate and explore options for their delivery of services in a different way. The OSP is starting to address the limitations of existing approaches by allowing stakeholders to facilitate a more integrated and flexible approach to planning that creates a map of uncertainty and a broad visible understanding of the driving forces for change to ensure that the strategic objectives of healthcare providers, commissioners and regulators are achieved.

CONCLUSIONS AND RECOMMENDATIONS

This paper has highlighted the importance of a number of new theoretical concepts in open building, specifically the importance of infrastructure open scenario planning and scalability. Furthermore, it has explored the linkages between these concepts and introduced opportunities for ongoing research to develop and test a new approach to OSP. It has opened up a new line of thinking in open and scalable capacity planning that may be looked at favourably by estates and service healthcare planners alike and proposes the need to develop more aligned scenario planning approach that can integrate healthcare planners from various different disciplines in health and social care system design.

The authors' collaborative and action research has identified the need for a flexible, dynamic and a scenario based approach to planning, which precedes open building. Further the diversity of care pathways across a changing healthcare planning environment is also demonstrated using a case study review. Further review will investigate new techniques that seek to inform flexible services and estates design. In addition further action and conceptual development research is needed to validate the claims made about existing capacity planning and business case development tools. However, the experience of the authors has demonstrated that existing estates planning approaches are unable to keep pace with shifting service patterns, organisational structure changes or health and social care re-configuration strategy development. The

ultimate aim of the authors is to increase the life span of buildings and extend the notion of “future-proofing”, “change ready”, “open building” into healthcare planning.

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