UNDERSTANDING THE RELATIONSHIP BETWEEN THE ADOPTION OF INNOVATION AND INSTITUTIONS

An Exploratory Qualitative Case Study on NHS Procurement

A Thesis Submitted to the University of Manchester for the Degree of Doctor of Philosophy (PhD) in the Faculty of Humanities.

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CLARA ANAIS WEISSHAAR

Manchester Institute of Innovation Research (MIOIR)
Manchester Business School
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Abstract

Understanding the Relationship between the Adoption of Innovation and Institutions – An Exploratory Qualitative Case Study on NHS Procurement

A Thesis submitted for the degree of Doctor of Philosophy (PhD) in the University of Manchester
Clara Anais Weisshaar, 2015

Despite various efforts to introduce support measures and financial incentives to improve innovation in the public sector, it is widely perceived that the adoption of innovation is a slow and complex process (Albury, 2005; Coriat and Levinthal, 1990). Evidence of previous research indicates that the adoption of innovation varies considerably across public sector organisations, regardless of the perceived potential benefit of the new product (or service) (Cash and MOster, 2000; Edquist, 2005).

The public procurement and innovation literature emphasises the potential of public sector organisations as important buyers and adopters of innovation, highlighting the role of public demand for the triggering and diffusion of innovation (Edler et al. 2011; Cunningham and Karakasidou, 2009; Edquist, 1997). However, innovation adoption in the public sector has been characterised as a slow and unpredictable process where the underlying institutional factors that play a role in the adoption process are not fully understood (Albury, 2005; Allman et al., 2011). The topic of poor adoption in the public sector is of great significance, not only for the innovation agenda, but also due to the increasing pressure on the public sector to achieve higher quality services with more efficient allocation of resources, particularly the NHS (Bonoma, 1985).

The main objective of the research is to address the problem of slow and inconsistent adoption of innovation in the public sector, by providing a more holistic and institutional perspective to the study of innovation adoption, addressing the lack of context specific research on the topic. A major focus of this work is to understand the relationship between the adoption of innovation and institutions as a means to establish a more in-depth understanding of the institutional features that influence the adoption process. The research focuses on new technology procurement cases in the context of the English and Scottish NHS system, as two different institutional contexts, in order to identify the institutional features at the system’s and organisational level that make a difference in adoption of innovation.
Declaration

No portion of the work referred to in the thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

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Abbreviations

BPH = Benign Prostatic Hyperplasia
CAP = Clinical advisory panels
CCG = Clinical Commissioning Groups
CCU = Clinical Care Unit
DH = Department of Health
EC = European Commission
EU = European Union
HoLAP = Holmium Laser Ablation of the Prostate
HoLEP = Holmium Laser Enucleation of the Prostate
KPI = Key Performance Indicator
LHB = Local Health Board
MCN = Managed Care Networks
NICE = National Institute of Clinical Excellence
NHS = National Health Service
NHSSC = NHS Supply Chain
NP= National Procurement
NPF = National Planning Forum
PASA = Purchasing and Supply Agency
PCP = Pre-Commercial Procurement
PCT = Primary Care Trust
PP = Public procurement
PPI = Public Procurement of Innovation
QIPP = Quality, Innovation, Productivity and Prevents
OJEU = Official Journal of the European Union
R&D = Research and Development
SHA = Strategic Health Authority
UK = United Kingdom

[Blank] = Names of anonymous hospitals and participants are blanked out of the document.


About the Author

Clara Weisshaar has entered the full-time PhD programme at the Manchester Institute of Innovation Research (MIOIR) in September 2011. Prior to her doctoral research, Clara has worked as a Junior Consulting at a Science and Technology Innovation Consultancy, Inventya Limited. She was responsible for advising and managing consultancy projects on the introduction and launch of new technologies in various industries. Clara obtained her Master’s degree at the Manchester Business School in Global Business analysis with distinction and her Bachelor’s degree at the University of Aberdeen, Scotland in Management and French with distinction in spoken French.

Clara has been involved in a number of teaching, research activities and administrative work at the MBS and MIOIR as part of her commitment to the MBS PhD Studentship (2010-2014). She served as a seminar leader at the undergraduate course “Business of Healthcare” and marking assistant of written assignments in the course “Behavioural Strategy”. Further she has participated in the research project at the MBS Health Department "Flying high: How organisations can aim for top performance" and assisted in the organisation and preparation of the 2014 Eu-SPRI Conference ‘Science and Innovation Policy: Dynamics, Challenges, Responsibility and Practice’. In her final two years Clara has been additionally involved in updating and managing the contents on the MIOIR website.

Clara has presented her work at the 2014 Eu-SPRI INGENIO PhD Conference in Valencia where she won the ‘best paper’ and ‘best presentation’ award. She also received a ‘highly commended abstract’ award for the Innovation, Management and Policy (IMP) division at the MBS Doctoral Conference in 2013.
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Dedicated to

My dear Mother

Mary-Paz Weisshaar
Chapter 1: Introduction

1.1 Research background and objectives

Despite various efforts to introduce support measures and financial incentives to improve innovation in the public sector, it is widely perceived that the adoption of innovation in the public sector is slower and more varied compared to private sector counterparts (Albury, 2005; Fagerberg et al, 2005). Evidence of previous research indicates that the adoption of innovation varies considerably across public sector organisations, regardless of the perceived potential benefit of the new product (or service) (Denis et al., 2002; Naranjo-Gil, 2009). The topic is of great significance, due to the increasing pressure on the public sector to achieve more efficient allocation of resources and higher quality public services, particularly the UK National Health Service (NHS) (Cunningham and Karakasidou, 2009). For example, the NHS has been faced with stringent austerity measures to achieve up to £20 billion ‘efficiency savings’ by 2015, inherently driven by the pressures of an aging population and increasing healthcare costs. The adoption of innovation has been regarded as an important tool in achieving such savings, driven by significant political interest in improving the overall national and local incentive structures and bottlenecks to innovation adoption. In relation to the NHS, the importance of innovation adoption has been highlighted in the Wanless report published in 2002, capturing the slow adoption in the NHS followed by new reports which seek to address the challenges and set new directions for innovation in the future (i.e. Darzi Report and Innovation Health and Wealth to name a few). This has been coupled with the McClelland report promoting a more regional and collaborative perspective to the adoption of innovation, seeking to promote more effective procurement of beneficial and supported technologies. As one of the largest and widely recognized healthcare systems in the world, the NHS represents an iconic system to many countries in the world, indicating the global scale of the issue of innovation adoption and procurement beyond the UK. The challenges of innovation for quality and cost management in large complex organisations such as the NHS have become the focus of wider academic and practical audiences.

For example, public procurement (PP) and innovation literature emphasise the potential of public sector organisations as important customers to harvest innovation, highlighting the role of Public Procurement of Innovation (PPI) in achieving improved adoption (Lember et al, 2007; Georghiou, 2007; OECD, 2011). However, despite being such an important vehicle for innovation, PPI is still poorly performed at most public organisations. For example, the importance of public procurement in promoting innovation adoption in the NHS has also been of recent focus with the Department of Health’s (DH) Innovation Technology
Adoption Procurement Programme (iTAPP) introduced in 2009. The objective was to promote the procurement and adoption of existing medical technologies that lead to the improvement of patient outcomes and cost reduction in the NHS (NTAC, 2012). One of the main challenges reported as a result of the iTAPP programme was the overly bureaucratic and complicated procurement processes, indicating a lack in communication across stakeholders on the process and mechanisms (Edler and Yeow, 2012). Furthermore the cases observed significant resistance to the use of new technologies, indicating cultural and normative barriers to adoption. The programme was deemed successful yet observed significant challenges in overcoming resistance to change and adoption and issues in prioritization. The literature in particular highlights the importance to create a better understanding of the underlying conditions and contextual factors which influence the performance of PPI. This study is concerned with exploring the contextual and organisational factors that affect the ability and willingness of organisations to adopt innovation.

As public procurement is regarded as a highly interactive and social process embedded in large organisations and systems, the PPI bottlenecks have been argued to lie outside the procurement departments as can be observed from the iTAPP initiative above (Hurray, 2009; USAID, 2013). There has been increasing recognition of the importance of institutional set-up and structures in determining organisation’s decision-making behavior. The use of institutional theory therefore proves relevant to the study of PPI as a means to identify the underlying institutional features which drive adoption behaviour. The use of institutional analysis enables to analytically capture the phenomenon under study within its particular context (Scott, 1995). It is therefore important to distinguish between the different institutional dimensions to understand their impact and interplay on the adoption of technological innovation. In turn, the use of institutional analysis will help to create a better understanding of the underlying conditions and adoption challenges to PPI processes as a means to drive a more innovation-friendly institutional environment in the future.

**1.2 Gaps and research questions**

The key literature areas consulted for this research are innovation adoption, including public sector innovation literature, PPI and institutionalism literature. All strands of literature support the understanding of innovation processes from an institutional perspective, as a highly social and interactive process. Therefore, the main purpose behind combining the three main strands of literature was to contribute to the need for more context specific and empirical research as a means to provide a more holistic perspective to innovation adoption (Carljord et al., 2010; Allman et al., 2011; Dodgson and Rothwell, 1994; Currie and Weinstain, 2002). Innovation adoption literature argues for the slow and unpredictable nature of innovation adoption where the underlying institutional factors that play a role in the process are not fully understood (Albury, Carljord et al, 2010), particularly in relation to large “multi-level” complex organisations, as apparent in many public organisations such
as the NHS (Allman et al., 2011). Especially there has been significant inconsistencies on which key factors and mechanisms that influence adoption, lacking in sufficient grounding and explanation (Nelson et al, 2004). The literature particularly emphasises the importance of achieving more consistency and contextualised empirical insights to theory and practice of innovation adoption and procurement (Edquist and Hommen, 1999; Edquist et al. 2000; Kimberley and Evanisco, 1981). This research is further inspired by the on-going debate on the potential of public procurement (PP) to foster the adoption of innovation. There has been a reemerged interest in the role of public demand in stimulating innovation adoption in policy debates and EU (Rolfstam et al, 2010). The literature particularly highlights the need for more empirical research to overcome the “research to practice gap”, contributing to a growing empirical evidence base (OECD, 2011). Various policy debates on PPOI signalise the importance of the topic in providing better conditions for the uptake of technological innovations (Roflstam, 2008; Eder et al.2005). The potential of PP to stimulate innovation has increasingly been highlighted, however most research was concerned with the study of external (regulative) institutional features (Cohen and Levinthal, 1990; Denis et al, 2002; Fagerberg, 2004; Edler, 2010).

Due to the highly interactive and social process of innovation generation and adoption, the use of institutional theory enables to analytically capture the phenomenon under study within its particular context (Gagliardi, 1990). Hence, for the purpose of this research, the institutional literature provides a good link between the innovation and public procurement of innovation literature, allowing to investigate the institutional context in which adoption and procurement processes take place. However due to the multitude of institutional perspectives, there has been a call for a comprehensive framework to capture innovation adoption in a more holistic way. For this reason, this research adopts Robert Scott’s (1995) institutional framework which combines various overlapping and contrasting institutional schools into one single comprehensive framework. The framework best reflects and captures the richness and diversity of institutional analysis, combining the given and more ‘fixed’ regulatory features, with the “softer” morally governed and culturally supported variables of norms and cognition. This research therefore applies a multi-dimensional institutional perspective to explore the underlying predispositions to innovation adoption according to its context. A further important level of analysis laid out for the purpose of this research is the distinction of the institutional features that are externally defined and impact on organisation from the outside (the exogenous) and the features that are internal to the organisation (the endogenous) (Rolfstam, 2010). The exogenous and endogenous interplay has been particularly highlighted in the literature for the importance of understanding the various contextual and organisational factors at the different institutional dimensions for improved innovation adoption in the future (Smith and Charlesworth, 2011; Ham et al,
For this research the institutional framework combines Scott’s three institutional dimensions with a multi-level perspective of the wider extra- and intra-organizational set-up to understand complementing or tensions within both, the organisation and their environment and within an organization itself. As a large and complex public sector organisation, the NHS represents a good example for the study of institutional factors to derive a better understanding of the problem of slow and inconsistent adoption of innovation in the public sector. Thus this research focuses on new technology procurement cases in the context of the English and Scottish NHS system through representing two different institutional contexts the aim is to identify the institutional features that make a difference in adoption of innovation.

However, there yet has been limited attempts in the literature to fully apply Scott’s institutional framework, calling for greater empirical research to test and operationalise three institutional dimensions, and their interdependence (Mizruchi and Fein, 1999; Kostova and Roth, 2002; Greenwood et al. 2008). For the purpose of studying the conditions which shape the adoption behaviour of public sector organisations, it is important to distinguish between the different institutional dimensions to understand their impact and interplay on the adoption of technological innovation. As a merely neglected empirical area and differences in institutional arrangements, the English and Scottish NHS system are of particular interest to this study (Allman et al., 2011). This will allow for deriving a better understanding of the national institutional framework conditions for explaining and predicting innovation adoption in the future (Damanpour, 1998; Wolfe, 1994). The case study approach adopted for this research enables to capture not only the system differences but also organisational differences in institutional set up and adoption behaviour. The research hence provides the opportunity to theoretically and empirically explore, operationalise and apply the institutional framework and investigate the role of different institutions on PPI in multiple NHS procurement case studies in two different institutional environments of the English and Scottish NHS. While adopting an institutional perspective to innovation adoption, this study will feed into current PPI discussions on more effective policy tools to stimulate the uptake of innovation and will have significant implications for theory, policy and practice.

Following the complimenting areas of literature and problematic of PPI in large complex organisations, the main research question to this research can be derived:

"What are the underlying exogenous and endogenous institutional features that affect the ability and willingness of buyers to adopt an innovation and how do these institutional factors influence the adoption of innovation?"

The empirical application of the conceptual framework is aimed to present an in-depth
and thorough analysis of institutional variables across the three dimensions and institutional levels. This research will therefore further contribute in drawing on the strengths and any potential challenges encountered in the empirical application and operationalisation of the presented framework. The study is underpinned by the assumption that a better understanding of the underlying institutional contexts could significantly contribute to more effective adoption processes and policy making in the future.
1.3 Thesis structure

This thesis is organised into four main parts, starting with the review of the literature and theoretical underpinnings (Chapter 2: Literature Review), the conceptual framework and research design (Chapter 3: The Conceptual Framework and Chapter 4: Methodology & Research Design), data presentation and analysis (Chapter 5: Context Analysis – The English and Scottish NHS system, Chapter 6: NHS Procurement Case Studies and Chapter 7: Couplet Analysis), and discussion and contributions (Chapter 8: Cross-case Analysis). An overview of the structure is illustrated in ‘Figure 1: Thesis Structure’ below.
Chapter 2: Literature Review – presents an in-depth review of the literature for this research, drawing on three key areas of research: Innovation Adoption, Public Procurement of Innovation (PPI) and Institutional theory literature. This section is concerned with elaborating the research problem on the basis of the main gaps identified in the literature, which will feed into the development of the research questions and conceptual framework in Chapter 3: The Conceptual Framework.

Chapter 3: The Conceptual Framework – is concerned with presenting the detailed development of the conceptual framework, drawing on the various definitions of institutional boundaries in the literature review and Robert Scott’s three institutional pillars of the regulatory, normative and cultural-cognitive.

Chapter 4: Methodology & Research Design – articulates and operationalises the core research question into a set of sub-questions based on the conceptual framework in Chapter 3: The Conceptual Framework. This is followed by the description of the qualitative research design of a ‘multiple case study’, addressing the core methodological questions of data collection and data analysis.

Chapter 5: Context Analysis – The English and Scottish NHS system – then presents the analysis of the case study context, eliciting the key national framework characteristics of the English and Scottish NHS system. The contextualisation of the cases incorporates a detailed overview and comparison of the organisational structures and the overall regulative, normative and cultural-cognitive set-up of the two systems. This includes a succinct description of the procurement and innovation systems in the context of the English and Scottish NHS.

Chapter 6: NHS Procurement Case Studies – based on the collected case study data, this chapter presents the detailed narrative stories of the six case studies. The narratives start with describing the individual organisational background and technological factors, the overall adoption process, including the decision-making and procurement processes, and followed by the case outcomes.

Chapter 7: Couplet Analysis – presents the first set of case analysis organised in couplets, as a parallel investigation and comparison of the procurement cases of the same technology in the two different institutional contexts of the English and Scottish NHS system.

Chapter 8: Cross-case Analysis – then combines the analysis and outcomes from the previous chapters 5 to 7, reflecting on the national institutional differences, to present a cross-case analysis of all procurement cases. The analysis is organised according to institutional context of the English and Scottish NHS, as a means to analyse the detailed
interplay of multiple institutional and other factors as well as derive the key framework conditions which proved to play a role in innovation adoption.

**Chapter 9: Discussion and Conclusion** – seeks to link the presented research findings back to the core literature and research gaps. This chapter in particular highlights the key conceptual and theoretical contributions to institutional theory, followed by empirical and practical contributions to public sector organisations, as well as eliciting key implications for policy and practice on innovation adoption and PPI. Finally, this chapter concludes with a number of suggestions for further research.
Chapter 2: Literature Review

2.1 Introduction

This chapter explores the main pillars of literature which have informed and provided the foundations to this thesis. The three key strands of literature consulted for this research are the Innovation Adoption and Diffusion literature, Public Procurement of Innovation (PPI) literature and literature on institutional theory. Following inconsistencies in research findings on the role and practice of innovation adoption and PPI, the use of institutional theory will help to establish a comprehensive and more systematic analytical framework to tackle unclear definitions of research boundaries. The combination of the three strands of literature further facilitates to empirically enrich the conceptual understandings and institutional perspectives on innovation adoption and PPI, for more informed adoption processes and policy formulation. The review of the literature therefore seeks to provide a more in-depth understanding of innovation adoption and PP from an institutional perspective, drawing on the need for more empirical and systematic research on public sector organisations and the NHS.

First, this chapter starts with a review of concepts and definitions of innovation adoption and diffusion as a means to situate this research within this vast literature and will then proceed to discuss innovation adoption in large complex and public sector organisations. Secondly, the chapter goes on to discussing the public procurement literature in the light of innovation adoption (PPI) and NHS procurement, and finally the institutional theory literature. The latter discussion on institutional theory literature incorporates a review of core definitions of institutions in the light of this research and provide an overview of the current state of the art in the study of institutions of large complex organisations and innovation adoption.

2.2 Innovation adoption

2.2.1 Defining innovation and innovation adoption

The concept of innovation has been widely inquired and applied across different fields and levels of analysis. While a plethora of definitions of innovation exist, there has been a perceived inconsistency in definition and findings in innovation research with “no widely accepted theory of innovation adoption in organisations and this along with other
empirical problems frustrates our efforts to make sense of the empirical results” (Rye and Kimberly, 2007:254; Wolfe, 1994). For this reason it is important to appropriately define innovation and its application in the light of this research. One of the early and classical conceptualisations of innovation was derived from economic perspectives on the study of economic growth and competitive advantage by Schumpeter (1934), introducing the concept of “creative destruction”. Through this concept, innovation was described as deeply embedded in historical and structural developments, in which the impact of innovation implies the destruction of old structures through the creation of new ones (Sledzik, 2013). Schumpeter highlights the elements of change and disruption of innovation, signifying the highly context-dependent nature of innovation in being influenced and in turn influencing the environment in which the innovation occurs or is applied to (Kotsemir and Abroskin, 2013). Similarly Drucker (1985) emphasises the element of change and disruption of innovation where old structures dissolve through the creation of something new (Drucker, 1985). While this concept focuses more on the economic perspective of the destruction and creation of new markets, scholars of the organisational level literature emphasise the complex and interactive nature of innovation in the light of a social system (Pettigrew, 1987; Hollingworth, 2000). According to Rogers, a social system is defined by “a set of interrelated units that are engaged in joint problem solving to accomplish a common goal (Rogers, 1995:23). Throughout of this thesis, the concept of innovation is therefore dependent on its context and highly variable nature of social change shaped by individuals, informal groups, organisations, or subsystems.

Moving from the concept of innovation, the element of ‘change’ further plays a role in the adoption of innovation, inducing a “change that creates a new dimension of performance”. (Hesselbein et al., 2002:1). The term adoption (in relation to diffusion) in turn is a form of deployment which refers to the decision of organisations whether to buy, implement and use an innovation (Rogers, 1995). The latter definition therefore claims that it is not only about the creation and adoption of new ideas but also signifies adding value to the adopting organisation (Ling, 2002). Hence, the adoption of innovation is determined by the perception and interpretation of its potential adopter. In particular, Roger emphasises the notion of “novelty” of innovation to its adopter referring to “an idea, practice or object that is perceived as new by an individual or other unit of adoption” (Rogers, 1995:11). ‘New’ emerges as an evidently relative term and can refer to products and services which are “new to a firm or organisation, a sector, industry or market, to the country or to the world” (Miles, 2012:3). In the frame of this research, innovation will be studied from the perspective of the adopting organisation, focussing on the specific adoption behaviour of the individual unit (Hollingworth, 2000; Rogers, 1995).
Numerous distinctions between different types of innovations have been identified in the literature, drawing on the level of novelty, time and change of the innovation, which will help to classify the type of innovation adopted for this research. First of all, Freeman (1982) distinguishes between incremental and radical innovation. The former refers to the processes of refining and gradually improving innovations, which can occur through fast successions of incremental innovations and over time. Radical innovation on the other hand involves the creation of a “new dominant design” (Henderson and Clark, 1990), such as the introduction of a completely new technology, which is distinctively different to former designs. A further important type of innovation has been referred to as disruptive innovation by Christensen (1997), linking back to Schumpeter’s elements of change in the creation of something new in the destruction of the ‘old’ and the disruptions to existing markets or value networks. Coupled with the element of change and disruption, this research focuses on the definition of innovation in relation to driving elements of improvement at the adopting organisation, such as increased efficiency, improved working processes or competitive advantage to name a few (Kotsemir and Abroskin, 2013).

As this study focuses on the study of innovation adoption in healthcare organisations, a range of technological innovations need to be distinguished in order to inform the appropriate definition adopted for this thesis. Commonly encountered terms of healthcare technology innovation in the literature have been overlapping and broad in the boundaries of definitions, ranging from ‘biomedical technology’ which include drugs and devices, ‘medical technology’ of drugs, devices and procedures, ‘healthcare technology’ and ‘health technology’ incorporating drugs, devices, procedures and organisational support systems. Due to the context-dependent nature of the innovation process it is therefore important to distinguish the type of innovation focused on.

Therefore, in the context of this research, an innovation is defined as a new medical device which is perceived as ‘new’ to the adopting organisation, which presents novel functionalities and improvements to current healthcare delivery. The level of disruption an innovation causes, including organisational and/or behavioural changes, form an important part of the analysis as part of the context-dependency of adoption processes. This research deliberately excludes the study of service or process innovation and the study of pharmaceuticals, due to differences in the innovation process and contextual factors (Knight, 1967; Rowley, 2011). Furthermore, medical device (non-pharmaceutical technologies) have received less attention in the literature than the study of pharmaceutical adoption, with recent research indicating the need for more contextual data on the study of ‘organisational factors’ impacting on the adoption of medical device technology adoption (NIHR, 2008).
Finally, it is important to take into account the dynamic and time-dependent nature of innovation, encompassing the stages prior to the approval of a new product, service or idea within a decision-making process (Rogers, 1995:21). In the literature different stages of innovation were discerned, often referred to as the initiation, adoption and implementation (Orlando, Volpe and Renzi, 2013). The first stage refers to the pre-purchasing decision-making process, in which initiation implies the awareness building of the potential adopter, defined by the highly context dependent interpretations, attitudes and evaluation of the innovation (Framback and Schillewaert, 2002). Finally the adoption and implementation stage then encompasses the adoption and purchase of the innovation, which further defines notions of acceptance and assimilation of the adopter, defined as “the decision to make full use of an innovation as the best course of action available” (Rogers, 1995:21). The three innovation stages further reflect the highly context dependent nature of innovation, where the acceptance and attitude is influenced by external as well as internal organisational context and the level of disruption the innovation causes to the adopting unit (Greenhalgh, 2002; Greenhalgh and Healthfield, 2007). The adoption of innovation however needs to be distinguished from the closely related and overlapping term of diffusion of innovation, which boundaries can be easily blurred. According to Rogers “diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system” (Rogers, 1995:5) referring to the spread of adoption across different adopting units or network of adopters through communication and adaptive emulation (Strang and Macy, 2001; Greenhalgh, 2002). While diffusion might indicate the potential likelihood of an innovation to be accepted by an organisation, consequently affecting the speed of adoption, this thesis will focus on the adoption process as a means to understand the mechanisms and events of the initiation and decision-making process. In the light of this thesis, the study of innovation adoption will take into account the evolutionary nature of the decision-making process, including the stages of pre-adoption decisions (initiation of the idea), purchasing decision (decision to buy and procurement process)and post-adoption decision (willingness and ability to use). The innovation adoption process is therefore driven and defined by the ability and willingness of organisations to buy and use innovation, referring to the complex and highly interactive nature of adoption decisions. The definition adopted in this thesis draws on the highly context-dependent notion of innovation, where the adoption is determined by the relation of the benefit the potential adopter or user applies on the new product or service and the various costs associated with the adoption.
2.2.2 Adoption in the public sector

While the section above sought to differentiate between different types and definitions of innovation and innovation adoption, this section focuses on presenting the status quo of innovation adoption literature in the public sector. The study of innovation adoption has rapidly developed over the last decades, and has been thoroughly explored in various fields, including the traditional domain of science and technology (S&T) and more specialised fields such as economics, sociology, management and policy (Fagerberg, 2004; Godin, 2010; Dogson and Rothwell, 1994). Research in the areas mentioned above have been mainly concerned with well-funded “high-tech” industries such as aerospace, military and pharmaceuticals. In contrast, the study of innovation characteristics and adoption in public service sectors has been less prominent in the literature, with only limited publications available on ‘innovation in public services’ (Godin, 2010; Miles, 2012). This lack of research has been particularly surprising with regard to the significant size of the public services industry, which in the UK, for example, accounts for 7.2% of the GDP as well as the recent scrutiny on driving efficiencies in public spending and procurement (CBI, 2014). Evidence of previous research indicates that the adoption of innovation varies considerably across public sector organisations, regardless of the perceived potential benefit of the new product (or service) (Denis et al, 2002; Naranjo-Gil, 2009). The topic is of great significance, due to the increasing pressure on the public sector to achieve more efficient allocation of resources and higher quality public services, particularly the NHS (Cunningham and Karakasidou, 2009). Due to the highly context-dependent nature of innovation, the literature highlights the need to create a more thorough understanding of the institutional contexts, in particular related to multi-level institutions and complex organisations, such as the NHS (Carfjord et al., 2010; ICL, 2010). This research therefore seeks to focus on this under-researched area, taking the UK NHS system as an example, to establish a greater understanding of the diversity of innovation adoption processes and of the institutional settings that shape them.

2.2.3 Adoption in large complex organisations

One particular area which lacked attention in the literature was the internal organisational decision-making processes for innovation, especially in relation to “the impact of complex authority structures, political dynamics and conflict/consensus within an organisation” influencing the decision to adopt new technologies (Rye and Kimberly, 2007). While the literature consistently highlights the importance of organisational factors of hierarchy, culture, communication networks and clinical team functions, the role of
these elements in innovation adoption have been somewhat neglected (Robert et al., 2009).

Barnard (1961) defines organisations as “a cooperative system [of] complex physical, biological, personal and social components which are in specific systematic relationship by reason of the cooperation of two or more persons for at least one definite end” (Barnard, 1961:14). The latter definition therefore emphasises notions of communication between stakeholders influencing internal beliefs, attitudes and behaviours of actors. The processes of innovation can be described as “complicated feedback mechanisms and interactive relations involving science, technology, learning, production, policy and demand” (Edquist, 1997:1). Innovation adoption decisions are therefore dependent on organisational subjectivity and highly variable nature of the social system shaped by different external and internal factors of individual actions of groups, individuals or organisations (Hollingsworth, 2000; Edquist, 1997).

The literature on innovation adoption particularly emphasises the lack of understanding of institutional contexts for innovation adoption in relation to large ‘multi-level’ complex organisations, as apparent in many public organisations such as the NHS Robert et al., 2009). Public sector organisations are argued to consist of complex multi-professional environments, which are typically characterised by multiple levels of interactive authority and governance structures, stakeholders and political pressures (Robert et al. 2009). A number of organisational factors have been identified in the literature, which are believed to influence the willingness of organisations to adopt innovation, broadly covering the structure, formalisation and professionalism in organisations (Kennedy, 1983; Morrison, 1996); roles and learning capabilities of individuals and groups, the strategic positioning of the organisation in the market, the nature of internal power relations within the organisation and finally, the nature and level of interaction and participation of stakeholders in the decision making and implementation of the technology (Robert et al, 2012; Llewellyn et al, 2014; Rye and Kimberly, 2007). In particular, authors highlight the importance of structural characteristics as significant influencing factors to the decision-making process within organisations such as the level of organisational complexity, formalisation, centralisation and interpersonal relations (Kennedy, 1983; Morrison, 1996). However, most importantly the organisation size and complexity plays a particular role in determining internal adoption behaviour, due to the existence of diverse structural arrangements and incentive systems within an organisation (Kennedy, 1983). Organisational complexity has been characterised by “an increase in the number of occupational specialities in the organisation and their professionalism; an increase in the
sources of information available to members and an increase in apparent inter-group conflict” (Kennedy, 1983; Hage and Aiken, 1970). Healthcare organisations in particular were commonly characterised as highly institutionalised and professional bureaucracies that operate at different levels and forms (Scott, 1990; Currie and Guah, 2007; Party, 2010). Therefore, this research defines multi-level as an unambiguous characteristic of complex and disjointed external and internal sets of institutional features, which can influence an organisation’s processes, culture and behaviours (Dattee and Barlow, 2010; Scott, 1990; 2007; Fitzgerald et al., 2002; Ostrom et al., 2002). Following this definition, the adoption and use of innovation by health organisations can be said to be institutionally determined, in which the type of organisation and structure has proven to be an important influencing factor on the adoption process due to its effect on the communication flow within and across organisations (Rolfstam, 2008; Scott, 2007; Coriat and Weinstein, 2002).

However, the decision to buy and use innovation can be influenced by the diversity of perspectives at stake. While the involvement of multiple stakeholders may increase the awareness and knowledge of innovation, the risk of potential conflict between different groups of stakeholders is relatively increased and may explain delays in the decision-making process. In relation to the other organisational characteristics of the level of formalisation, centralisation and interpersonal relations, the adoption process can be influenced to varying degrees affecting the level of creativity and flow of innovation as well as the receptiveness of the organisation towards new technologies (Damanpour, 1998). Despite the wide array of organisational and institutional factors studied in the literature, a number of scholars criticised the research on the lack of consistency and systematic rigour in presenting the underlying explanatory factors (Wolfe, 1994; Rye and Kimberly, 2007). The literature therefore highlights the need for a more in-depth understanding of the underlying predispositions of innovation adoption in relation to large and complex organisations, with particular attention to establishing a comprehensive theory for explaining and predicting adoption behaviour.

2.2.4 Innovation adoption in the NHS

Despite the abundance of new medical technologies available to improve health outcomes and productivity of healthcare organisations, the NHS has been generally acknowledged as a slow and disparate adopter (NHSIQ, 2009; Llewellyn et al., 2014; Liddell et al., 2008). Coupled with the increasing demographic changes of a growing and aging population, an increase in chronic disease and tight financial constraints, the
adoption of innovation has been considered as an integral part to responding to these challenges (DH, 2011). A critical element highlighted in the literature is the receptiveness of organisations to embrace innovation, indicating that “even with hard evidence of superior efficacy it generally takes around 15 years […] for widespread adoption of a new intervention” (Sir Bruce Keogh, in Llewellyn et al, 2014). The NHS adoption literature equally emphasises the context-bound nature of innovation adoption, suggesting that the key factors of successful innovation are not to be studied in isolation but within its dynamic relationship within a system as a whole (Greenhalgh et al. 2012) particularly the importance of organisational characteristics and the external environment in shaping the adoption decisions for innovation (Robert et al, 2010; Llewellyn et al, 2014).

However, most of the research focuses either on one aspect of analysis: the external environment of regulative factors such as financial incentives and policy or on organisational characteristics such as organisational processes and capabilities to innovation adoption (Sorenson et al., 2013; Rosen and Mays, 1997; Philips et al., 2007; Wilson, 2006; Kyratsis et al, 2012; Blumenthal, 2009). A number of studies highlight the importance of the organisational context and underlying cultures in the NHS as potential barriers to innovation adoption and diffusion, affecting organisational behaviour such as stakeholder cooperation, stability of management structures, and other more psychological factors such as trust, openness, authority structures affecting the organisational ‘readiness’ to adopt (Liddell et al., 2008; Hailey and Crowe, 2003; Jennett et al., 2003; Edmondson et al., 2001). Other research further emphasises more normative and cognitive elements such as organisational routines, behaviours and mental models (Dattee and Barlow, 2010; Levitt and March, 1998; Leonard-Barton, 1995; Weick and Sutcliffe, 2003). While a plethora of factors have been explored, most empirical research was merely restricted to a single-level of analysis focusing on individual, organisational or regulatory settings. (Sorenson et al., 2013; Rosen and Mays, 1997; Blumenthal, 2009; Philips et al, 2007; Wilson, 2006; Kiratsis, et al, 2012). The literature therefore fails to capture the complexity and interactive nature of innovation adoption in the light of the different levels of analysis, calling for more qualitative research on the underlying explanatory factors of the local adoption behaviour for innovation (Robert et al., 2010). This is particularly important due to the dynamic nature of innovation adoption in complex organisational systems such as the NHS, aligning technological, social, organisational and wider contextual dimensions. This research therefore seeks to provide a more holistic analysis to the adoption of innovation in the NHS, seeking to understand the influence of and relationship between the wider external and internal organisational factors and the organisational decision-making processes for innovation adoption.
2.3 Public procurement and innovation adoption

Following the definition of innovation adoption elaborated in 2.2.1 Defining innovation and innovation adoption, procurement plays a vital part in the adoption process, especially in determining the underlying capabilities and user-producer interactions in the decision-making process of public organisations. The PPI literature therefore supports this research in delivering starting assumptions of institutional factors that influence the ability and willingness of organisations to buy and use innovation.

2.3.1 Public procurement

Public procurement is not a new concept in the literature and has been extensively studied since the 1990s as a government tool to respond to increasing demands of financial, technological and competitive pressures in the public sector. Public sector procurement has been defined in the literature as “the purchase of goods or services to enable public-sector organisations to undertake their primary functions.” (Uyarra and Flanagan, 2010; Cabras, 2011). As highlighted by the UK Office of Government Commerce “good procurement is essential to delivery good quality public services” indicating the importance of skills and capabilities to ensure “world class procurement capability across Government” (OGC, 2007). Representing 40% of public sector expenditure and 20% of the total UK GDP in 2011 (Hughes, 2011), PP has received considerable attention in the literature on its importance to stimulate national, regional and local development for social and economic improvement (Murray, 2009). The government is therefore often referred to as the largest single customer within a country, whose strong purchasing power has the potential to influence the behaviour of private sector firms (Walker and Brammer, 2007). However, due to the highly context-dependent nature of procurement processes, sources of bottlenecks often lie outside of the purchasing department (USAID, 2013).

With the increasing pressure on the public sector to achieve more efficient use of resources within an increasingly financially volatile environment and abundance of complex product choices, PP has been argued to be an important strategic tool in responding to these growing challenges (geldermann and van Weele, 2005; Murray, 2009). Several factors have been highlighted in the literature as important elements in the procurement process. The types of factors identified are (1) the existence of champions as an individual or group, (2) internal capacity, skills and knowledge of procurement environment, (3) established or accessible networks, (4) vertical and horizontal communication links on transparency of processes, information and knowledge flow (USAID, 2013; Murray, 2009), (5) buyer-
supplier relationship, (6) access of funds; (7) coordination of corporate and functional objectives of different divisions and departments within an organisation (Ansoff, 1985; Joyce, 2000; Leenders et al., 1989) and vertical and horizontal accountability structures within an organisation and government (USAID, 2013; Murray, 2009). The wider decision-making stages and involvement of internal and external stakeholders before, during and after the procurement process play an important role in determining the strategic direction of an organisation. The process of PP therefore is not only a precondition for adoption, it can be argued to be highly interdependent with the adoption of innovation, reflecting the complex and context-dependent nature of the decision-making process. The following section will focus on the study of PP as a strategic tool to foster innovation adoption in the public sector, referred to as Public Procurement of Innovation (PPI).

2.3.2 Public procurement of innovation (PPI)

PP has received great deal of attention in the innovation policy literature due to its potential to draw on the public demand to foster innovation (Erridge, 2007). This section will start by presenting key definitions and two main approaches to PPI in order to provide context for its use within this study. This will be followed by an overview of the main obstacles to the application of PPI encountered in the literature.

2.3.2.1 Distinguishing between two main approaches of PPI

PPI has been classified in the literature as a demand-side innovation policy comprising of “a set of public measures to increase the demand for innovations, to improve the conditions for the uptake of innovations or to improve the articulation of demand in order to spur innovations and the diffusion of innovations” (Edler and Georghiou, 2007: 952). Hence, for the definition of PPI in this research two main approaches of PPI need to be distinguished. First, PP is often defined as a tool for stimulating the development of new products (goods, services, systems) and secondly, as an attempt to increase the access to innovation (Uyarra and Flanagan, 2010; Rolfstam, 2012; Edler et al., 2011; Allman et al., 2011).

The former approach is particularly concerned with stimulating markets in developing new technologies in response to a specific demand of a public organisation and "occurs when a public organisation places an order for the fulfilment of certain functions within a reasonable period of time (through a new product) (Edquist and Zabala-Iturriagagoitia, 2012). This definition is also referred to as 'triggering demand', which is concerned with
the use of public demand to stimulate the development of new innovations in the private sector through triggering innovative effort (in the form of R&D by the supplier to produce something new (Edler et al. 2010; Allman et al., 2011; Rolfstam, 2012).

The latter approach, also known as ‘responsive demand’, refers to a broader definition of PPI and main focus of this work. Here, PPI is understood as a tool for stimulating the adoption beyond the development of new products, focussing on organisational capabilities and creating innovation-conducive environments to stimulate the adoption of innovations (Hommen and Rolfstam, 2009; Edler and Georgiou, 2007). This involves the use of public organisation’s buying power to target the existing innovations in the market that struggle the introduction into the market place. In both cases, the successful implementation of PPI is believed to lead to improved public services, while stimulating the uptake and innovative activities of organisations.

2.3.2.2 Key challenges to PPI research

In the light of more systemic perspectives to the study of innovation, public procurement has been essentially regarded as a social process governed by institutions (Rolfstam, 2009). The procurement behaviour of public organisations is therefore argued to be highly context-dependent within the rules of a social system, affecting the ability and willingness of organisations to procure innovation. However, most research often overlooks the complexity and interactive nature of innovation adoption between wider organisational and institutional factors, primarily employing a single level of analysis to the study of innovation adoption (Carljord et al, 2010; Rolfstam, 2008, Edquist and Hommen, 1999). Particularly, research on the role and practice of procurement and adoption of innovation is marked by strong inconsistencies in findings due to unclear definition of organisational boundaries (Rolfstam, 2008). For example, most research focused on the study of more effective framework conditions to facilitate PPI, such as the role of standards (EC, 200003) and the role of government in fostering the application of PPI as a policy instrument (Europe INNOVA, 2008). The literature particularly highlights the failure of public sector organisations in fully capturing innovation through PP, highlighting that the implementation of government strategies and initiatives were challenging and slow (Uyarra et al., 2014).

While an array of different innovation and institutional theories have been applied, there is a lack of systematic and generalizable analytical frameworks available especially in the context of large complex organisations (Edquist and Hommen, 1999; Edquist et al., 2000; Rolfstam 2012; Scott, 1995; Kimberly and Evanisco, 1981). The need for a comprehensive theory in innovation adoption literature dates back at least to 1981 and still persists, with most research focusing on behavioural theory (Eccles et al., 2005;
Powell et al. 2006), Step models (Grol et al, 2005) or implementation theory (Carljord et al., 2010), yet still lacking in a more holistic and empirically tested analytical framework (Kimberly and Evanisko, 1981). Hence this thesis has attempted to address the need for more systematic and consistent work through applying an institutional perspective to PPI and innovation adoption.

This research in particular builds on Rolfstam's (2008) initial foundations of an institutional theory-based approach for PPI policies, by seeking to capture the relationship between the multiple levels of institutions of the internal organisation and wider context. While the importance of the institutional context is becoming more widely recognised, most research is yet unable to account for the variable and changing nature of procurement dynamics for PPI (OGC, 2008; Edquist et al. 2000). In response to this, various policy debates highlight the importance of the topic in providing a more innovation-friendly institutional set-up beyond the study of formal institutions, calling for a better understanding of the underlying conditions for the adoption of technological innovations (Rolfstam, 2008; Edler et al., 2005; Edquist et al, 2015; Uyarra et al., 2014; Rolfstam, 2012). For the purpose of this research, the focus will be on responsive demand as a means to explore the ability and willingness of public organisations to adopt and use new products or services (Allman et al., 2011). The innovation process will therefore be studied from the perspective of the adopting organisation, focussing on the specific adoption behaviour of the individual NHS hospital. While the details of policy debates on demand-side innovation policy instruments will not be the focus of analysis in this research, this research will draw on the assertion that demand plays an important role in the adoption of innovation.

2.3.3 Public procurement of innovation and adoption in the NHS:

This section presents an overview of recent research on PP in the NHS. The literature demonstrates the strong interest of policy makers in the potential role of NHS organisations in harnessing innovation. However, a number of important challenges to the adoption of innovations have been identified, which will be discussed in the latter part of this section.

2.3.3.1 NHS as a potential customer to innovation

The NHS is regarded as a major user of many technologies and innovations, however its role and influence as an effective procurer of innovation has received insufficient attention in the literature (Phillips et al. 2007). Public sector reports particularly highlight the slow
and inconsistent adoption of new technologies in the NHS, emphasising the need to harness the strong purchasing power the NHS holds to promote innovation (Wanless, 2001). With an annual procurement spend of over £20bn on medical goods and services, the NHS represents one of the largest public spenders in the non-defence sector in the world on healthcare products (Neville, 2015). The procurement spend in the NHS comprises approximately 20% of the total UK public sector spend (Mistry, 2012; NHS England, 2013). Recent NHS research particularly emphasised the potential of leveraging the collective buying power and effective procurement processes in achieving increased innovation adoption (OGC, 2003; NHSSC, 2013; DH, 2013). With the current restructuring efforts and stringent austerity agenda in the NHS, the importance in encouraging more innovation-driven procurement behaviour at local hospitals has been highlighted in the literature (DH, 2013). However, innovation adoption in the NHS is often highly variable, unpredictable and dependent on differences in capabilities and willingness of local organisations. This results into problems of price variation, duplication, or ineffective application of purchased goods or services (DH, 2013; Wendy et al. 2007).
2.3.3.2 NHS procurement and innovation adoption challenges

This section describes the underlying adoption challenges identified in the literature which acted as a barrier to effective innovation procurement. With the multi-professional environment of NHS hospitals, innovation adoption has been particularly marked by organisational complexity and ambiguity (Fitzgerald et al., 2002). Due to the strong professional bureaucracies and hierarchical structures, adoption research in other sectors is not directly applicable to the study of NHS organisations (Robert et al. 2009). As a result, this section focuses exclusively on eliciting the findings of research on the NHS and healthcare organisations for a more contextualised understanding of adoption challenges. A total of six key adoption challenges could be identified in the literature, which can be summarised as financial, managerial and cultural factors and will be addressed in turn.

The most prevalent adoption challenge highlighted in the literature concerns the access to capital and revenue funding for the procurement of innovation in the NHS. Due to the financially volatile environment and scarcity of resources, the ability and willingness to invest in new technologies was significantly reduced (Sjoeborg et al., 2007; DH, 2011a). The limited access to funding has been particularly attributed to budget silos and mismatch in priorities between hospital departments and financial bodies (ibid, 2011a; Ovretveit et al. 2007). The problem of budget silos has been particularly attributed to the individual funding structures between departments, which lead to unequal distribution of costs and benefits associated with the procurement and implementation of new technologies. Hence, the benefits of adoption often are not reaped by the same department which originally provided the funding, leading to disagreements or unwillingness to invest. This closely links to the second financial challenge identified in the literature, referring to problems of receiving adequate reimbursement for the revenue costs of an innovation. In this regard, NHS tariff structures have been criticised for failing to reward innovation adoption, leading to lack of incentives for organisations to invest in new technologies (DH, 2011b). While the tariff rates are flexibly negotiable according to local and regional needs, the lack of endorsement and prioritisation of innovation was perceived as a significant barrier to investment.

A further organisational factor which was identified in the literature as a barrier to innovation adoption is the problem of poor access to evaluative data and evidence. The Department of Health in particular highlighted the problem of poor access to evidence in increasing risk aversion to pursuing the adoption of a new idea and in turn reduce the overall receptiveness of organisations to new ideas (DH, 2011a; Patrick et al. 2006; Dampbell et al. 2014). The NHS has been particularly criticised for a lack of formal
mechanisms for disseminating evidence base and encourage the share of experience (HITF, 2004). While NICE is perceived as a good starting point for assessing available evidence base, the guidance has been criticised for providing insufficient comparative data on clinical- or cost effectiveness and often lacks in clear implementation signals (Campbell et al. 2014).

The access to evidence has been further attributed to lack of open communication links within and across organisations, and has been highlighted as a barrier for transparency and information flow in decision-making processes. In turn various studies observed the problem of potential resistance to innovation adoption and lack of cooperation between hospital departments and organisations (Blacke et al. 2006; DH, 2011a). This problem of inter and intra-organisational communication was argued to be attributed to the high variety of stakeholders and competing professional interests in the NHS, leading to disintegrated priority structures (DH, 2011b).

Finally, the level of formalisation and organisation culture further proved an important determinant of successful innovation adoption processes in NHS hospitals (DH, 2011b). The importance of managerial support and leadership was highlighted in driving more clarity in adoption processes and consistent priority structures within the multi-disciplinary environment (Campbell et al. 2014; Porter et al. 2008). The lack thereof has been associated with a reduced compliance or understanding of administered regulations and guidance, indirectly affecting managerial culture and integration of priorities (Rees et al, 2004; Newman et al, 1998).

While the adoption challenges identified above present a good basis for deriving starting assumptions for this research, it is important to understand the specific contextual factors which shape and explain the underlying adoption behaviour of organisations. Following the definition of innovation in ‘section 2.2.1 Defining innovation and innovation adoption’, innovation adoption is highly dependent on the nature of social interaction and the specific historical and contextual settings. Hence, the following sections will focus on exploring this complexity and multiple perspectives of institutions as a means to derive a comprehensive conceptual framework for analysis in ‘Chapter 3: The Conceptual Framework’.

### 2.4 Institutional theory

Due to the interactive and historical-bound nature of innovation adoption, the study of institutions is argued to play a central role in shaping an organisation’s ability and willingness to adopt innovation (Powell and DiMaggio, 1991; Hollingworth, 2000). Questions of what entails the boundaries of institutions and how they affect innovations in
its various forms have been central debates among institutional theorists (Edquist, 1997, Hollingworth, 2000). Theorists differ in their conceptualisation of institutions, evolving from the key perspectives of economics, political sciences and sociology leading to arguments ranging from rational choice institutionalism, historical institutionalism highlighting path dependency and temporal processes of institutions and sociological institutionalism which place greater emphasis on social structures and cultural influences (Powell and Bromley, 2013).

Against the background of a varied institutional perspectives and how they influence innovation adoption, the following section aims to give an overview of the relevant literature as a basis for developing the conceptual framework in 'Chapter 3: The Conceptual Framework’. The following section will discuss some of the key conceptualisations of institutions, drawing on neoclassical and new institutionalism, and present the key definition of institutionalism adopted for this research by Robert Scott.

2.4.1 Classical neoinstitutionalism in Economics

Traditionally, institutional analysis from neoclassical perspectives of early economists or economic historians has primarily looked at the role of “rule systems”, “enforcement” and “mechanisms” (Scott, 1997, p.36). Many theorists have emphasised the capacity of institutions to constrain and control behaviour, studying social phenomena as the dependent variable signifying a more positivistic account of institutional analysis. Hence regulative institutions are seen as being imposed on society where individual actions and thoughts are perceived as purely reactive and through predictable patterns (North, 1990). Individual needs and preferences are influenced by the regulative aspects of institutions imposed by a ‘rule maker’ (typically the state) that affects behaviour from the outside. Regulative institutions are described to have two types of dimensions, first “the formal written rules [and second, the] typically unwritten codes of conduct that underlie and supplement formal rules” (North, 1990, p. 4). North highlights that these rules and codes are equally subject to violation and hence require a mechanism of enforcement that will control and punish violated rules. While North (1990) incorporates a higher level of analysis by focusing on the origins of cultural, political and legal frameworks, his perspective still treats the analysis of actor behaviour as dependent variables in a cause-effect relationship to the wider institutional frameworks (Hirsch and Lousbury, 1996).

However, the study of regulative institutions has been criticised for not sufficiently capturing the complexity and holistic understanding of institutions, failing to acknowledge the interactive and interpretive nature of social behaviour (Jakoby, 1990, Scott, 1995;
Hollingsworth, 2000; Edquist et al., 2000). In this instance, institutions are perceived primarily as governance or rule systems, which generate the forms of commitment of rule-following and norm-abiding behaviour (Powell and Bromley, 2013). The merely positivistic accounts have been argued to be cognitively limited, focusing on the study of rationality and atomic behaviour of social entities. Hence, social behaviour is observed and analysed as dependent variables from the perspective of an external observer. As Hodgson emphasises, neoclassical accounts fail to “consider the possibility that the preference functions of the individual may be moulded by circumstances, such as the structure and culture of the firm, or that this phenomenon may be significant in analysing or understanding such institutions” (Hodgson, 1994:70). Despite this, most innovation studies continue to focus primarily on the study of formal, regulative institutions with little emphasis on other types and dimensions of institutions (Rolfstam, 2008).

2.4.2 Neoinstitutionalism in Sociology

More recently, some degree of consensus in furthering the Northian definition of institutions derived, emphasising the more interactive and interpretivist nature of social actors. Increasing number of authors particularly started to place greater emphasis on conceptualising the dynamics of institutional change, presenting a distinction of institutions that is externally defined and the self-grown internal institutions (Edquist and Johnson, 1997; Powell and DiMaggio, 1991; Coriat and Weinstein, 2002; Rolfstam, 2008). For instance, Coriat and Weinstein discern between ‘Type 1’ and ‘Type 2’ institutions. Type 1 institutions refer to the external environment in the form of authority and enforcement, which social actors need to conform to. A typical example of this would be formal laws that apply to all agents, while equally entailing a system of reinforcement and control, in order to punish any violation of that imposed structure. In contrast, Type 2 institutions take into account the organisation-specific aspects, referring to the rules established by the individual agents within an institution and are referred to as “‘private’ collective agreements between groups of agents” (Coriat and Weinstein, 2002, p.283). The concept of the macro institutional perspective is further elaborated by DiMaggio and Powell (1983), defining institutions as “environmental pressures [that] shape organisations” through the three mechanisms of coercion, mimetic, and normative. Hence such perspectives emphasise the more interpretivist nature of social behaviour, in which the institutional environment is interpreted, socially constructed and reconstructed over time and space. DiMaggio and Powell particularly emphasise this phenomenon in claiming “that organisations in the same environment will become structurally similar [demonstrating] isomorphism.” (1983:136). Hence, Coriat and Weinstein’s framework presents an
important stepping stone for understanding how institutions may determine innovation adoption, through acknowledging the more complicated mechanisms of normative and cognitive elements of adaptation and interpretation.

2.4.3 Towards an interpretivist & holistic institutional perspective

As briefly summarised above, the wide range of concepts and arguments are highly diverse and rest on contrasting assumptions and explanations. For the analysis of innovation adoption it is therefore necessary to adopt a holistic perspective to institutional analysis, moving beyond the merely reductionist, positivist perspectives (Scott, 1995). As highlighted by DiMaggio and Powell (1991:8) “The new institutionalism in organisation theory and sociology [presents a] rejection of rational-actor models, an interest in institutions as independent variables, a turn toward cognitive and cultural explanation”, with the unit of analysis going beyond the “aggregations or direct consequences of individual attributes or motives”. Hence, new institutionalists seek to replace the merely unitary conceptual paradigm where multiple variants in conceptualisations of institutional environments developed, broadly comprising of regulative, normative and cultural elements.

For the purpose of this thesis the adopted definition is based on the more interpretivist and empirical perspective of Scott, stating that:

“*Institutions are comprised of regulative, normative and cultural-cognitive elements that, together with associated activities and resources, provide stability and meaning to social life*” (Scott, 1994, p. 33).

While the three institutional elements summarised in the definition above have been identified by one or another social theorist as a vital ingredient of institutions, Scott sought to provide a more holistic account in knitting together three divergent conceptions of institutions. The definition entails a multifaceted nature of institutions, combining the regulative perspectives, with more interpretivist and symbolic accounts of normative and cultural conceptions of social behaviour. According to Scott (1995), institutions provide stability and meaning to social behaviour through the interwoven relationship between the conscious and unconscious and the legally enforced and taken for granted (Scott, 2008; Hoffman, 1997). Hence Scott’s account of institutions moves beyond merely reductionist, positivist perspectives of normative and regulative structures such as North’s formal and written rules (North, 1990; Jakoby, 1990; Hollingworth, 2000). The following sections will present the conceptual framework for this research, drawing on Scott’s three institutional dimensions, which will be elaborated in more detail in ‘section 3.2.1 The basic framework’.
2.4.4 Institutions, innovation and large complex public organisations

In relation to the adoption of innovation, the literature highlights the importance to recognise that firms and other actors may behave and perform very differently in different contexts. Empirical research on innovation adoption particularly highlights the context-bound nature of innovation, where differences in social behaviour is believed to be influenced and shaped by institutional differences across organisations, systems or countries (Davila et al., 2006; Hollingworth, 2000; Greenhalgh et al., 2005; Scott, 1995). As Djelic and Quack remark, institutional evolution and change is embedded within a multi-level and multi-layered historical process marked by various different actors and logics (2003). Hence, institutions are argued to consist of complex, often ambiguous internal and external institutional environment which influence and “structure social action in particular ways” (Knight 1992:2; Hollingworth, 2000; Hodgson, 2006). This has been referred to as the ”institutionalisation of external factors” (DiMaggio and Powell, 1991). Institutionalisation here refers to the process of creating and reinforcing actions and behaviours within a social group, involving the development of shared definitions and meanings to such behaviour (Berger and Luckmann, 1967, Schutz, 1962). However, this process is argued to vary greatly among different organisations or groups and is highly dependent on the overall institutional set-up such as authority structures, internal roles and responsibilities and established structures (Coleman, 1980; Tolbert and Zucker, 1983; Cohen et al., 1996). Hence, institutional characteristics have been argued to play an important role in determining innovation adoption and explanatory factors of variations in organisational responses. More recently scholars further placed greater emphasis on internal (or micro) institutions, highlighting the importance of individuals in sense-making, interpreting and responding to their institutional context (Jepperson, 1991; DiMaggio and Powell, 1991). Institutions are therefore continually reproduced through a multitude of internal and external factors through co-construction of individual’s interpretations and actions, combining institutional factors of rules, laws and norms as well as cultural factors of languages, routines and cognition. In order to analyse the process of adoption in large organisations it is therefore important to distinguish between institutional features that are externally defined and impact on an organisation from the outside (the exogenous) and the features that are internal to the organisation (the endogenous) (Rolfstam, 2008; Powell and Bromley, 2013). Exogenous being the given or imposed structures, affect the organisation from the outside to which the actors can exercise only little or no control over (Rolfstam et al. 2009). Endogenous institutions typically emerge within an organisation and usually comprise of non-tangible assets such as values, culture, and experiences that are built over time as a co-construction from the distinct processes, social interaction and exogenous environment (Teece et al. 1992). Endogenous institutions are therefore unique
to each organisation and highly inter-connected to exogenous pressures. Hence an organisation’s inertia to adopt innovation is not solely shaped by the external processes to organisations but also by the rigidities within the internal processes (Edquist, 1997). It is therefore important to take into account the interdependent and interactive nature of exogenous and endogenous institutional structures, which will be elaborated in more detail following the development of the conceptual framework in the following sections.
Chapter 3: The Conceptual Framework

3.1 Three institutional dimensions

The development of a rich theoretical framework is vital for establishing the assumptions and main research questions to this research, through exploring the underlying conditions and contextual factors under which a phenomenon is likely or unlikely to occur (Yin, 2004). For purpose of the study of innovation adoption in large complex health organisations, this research combines Scott’s three structures with the distinction of exogenous and endogenous institutions introduced above. In the following, the various features of the conceptual framework will be elaborated, starting with an in-depth account of the three institutional dimensions and an explanation of relative institutional carriers. Finally the complete conceptual framework is presented, followed by a reflection on the endogenous and exogenous relationship and operationalisation of the Scott dimensions.

The framework distinguishes Scott’s three institutional dimensions of the regulative, normative and cultural-cognitive features. The regulative institutions emphasise the rule setting and sanctioning elements of institutions, while the normative pertains elements of evaluation and obligation, and the cultural-cognitive institution involves the shared conceptions and frames through which meaning is understood and reproduced (Powell, 2007; Scott, 2005; 2007). Each individual pillar has been previously identified by a number of theorists emphasising their importance in shaping institutions, i.e. North on regulative structures (North, 1991), Selznick (1948) and Vaughan (1996) on normative elements and DiMaggio as an example of the cultural-cognitive pillar (1983). Scott sought to provide a more holistic account of institutions by combining the three divergent yet overlapping perspectives into one comprehensive analytical framework. The three pillars are highly interconnected and can be discerned by the basis of legitimacy they reveal, moving from “the conscious to the unconscious, from the legally enforced to the taken for granted” (Hoffman, 1997: 36). The following section will give an in-depth description of each dimension in turn.

The regulative institutions are concerned with legal systems and encompass the binding policies and rules of a social systems. Theorists supporting the regulative institutional pillar emphasise the coercive, manipulative and obligatory nature of regulative features (see Barnett and Carroll, 1993). Scott’s institutional framework recognises the regulative dimension in constraining and regularising organisational behaviour (Scott, 1995; Meyer and Scott, 1983). In this thesis, regulative institutions refer to the binding rules applicable to the health organisations in the two NHS systems under study. Examples of regulative
factors applicable to this study are the European-wide rules and laws such as the EU Procurement Directives at cross-national and system level, direct government mandates at national level or standard operating procedures within the local adopting organisations.

The normative dimension typically conveys more informal structures of social obligation, which pertain to preferred and expected social behaviour (ibid. 1995; Selznik, 1948). Normative defines the more morally governed elements such as the goals and objectives (values) and belief systems of a social system. Hence normative pillar can have a constraining effect on social behaviour and actions while at the same time serving to empower and enable change through morally binding rights, responsibilities, privileges and duties. Examples of normative factors in this research are norms of collaboration or values of equity in the Scottish cases and norms of competition, accompanied by values of clinical excellence.

Finally, cultural-cognitive institutions are concerned with the development of shared conceptions of beliefs, mental models and interpretations providing frames through which meaning is given (Scott, 2008). This dimension therefore places greater emphasis on the mental and cultural processes of institutions, representing the meanings, symbols and cultural facets of a social system, which underpin and unconsciously shape social actions (Powell and DiMaggio, 1991). Hence, cultural-cognitive elements are typically taken-for-granted and unconsciously adopted by individuals, manifested through common-sense, perception of truth or as self-explanatory.

In turn, all three dimensions reflect a different form of legitimacy and compliance, which is important to distinguish in order to understand and analyse organisation behaviour. The regulative features are typically endured through conformity, driven by emotions of fear and coercion, while normative institutions emphasise morality of right or wrong. The latter is characterised by honesty, respect or cheating in response to adhering to or disobeying a normative expectation. Cultural-cognitive elements driven by shared mind-sets, mimetic behaviour and adaptation.

3.2 Importance of institutional carriers

The three dimensions are further underpinned by a set of institutional carriers through which social actions are conveyed. The distinction between the three levels of analysis and institutional dimensions plays an important role in understanding the time-dependent nature and interplay of institutions to explain social behaviour (Powell, 2007;
Scott, 2007). The various ‘carriers’ help to consider the ways in which change, behaviours and actions across the three pillars are conveyed (Scott, 2007). Scott distinguishes a total of four carriers, the symbolic and relational systems, routines and artefacts which operate across the multiple institutional dimensions (Scott, 1995; 2007). The regulative, normative and cultural cognitive dimensions therefore work in a symbiotic and independent nature towards an interrelated social framework (ibid., 1995).

The first carrier of symbolic systems constitute the features which are transmitted as a representative meaning through the use of written or oral language. While rules and regulations are typically written and legally reinforced, normative values and beliefs can be communicated and internalised through various means, such as communication technologies for the broadcasting of images and ideas across boundaries. At the same time these images and ideas are transported, merged and interpreted with individual or local knowledge internally learned and recapitulated, forming the cognitive, taken-for-granted meanings (Scott, 2007).

Secondly, relational systems, on the other hand, rely on patterns of interactions across role systems and determine the extent to which an organisation may be differentiated, assimilated or held equivalent on a cognitive dimension. Routine carriers can be described as habitualised behaviour, “reflect[ing] on patterned actions that reflect the tacit knowledge of actors” (Scott, 2007:82). Such activities tend to involve more unconsciously derived tacit knowledge and skills which involve repetitive patterns of activity, such as standard operating procedures on a regulatory pillar, or jobs, principles and processes on a normative pillar. Routines therefore create the “stability” of organisational behaviour. Examples can be standard operating procedures or standard formulae.

Finally, artefacts can be described as “material culture” which assist in the performance of various tasks and embody notions of symbolic elements (Scott, 2007; Suchman, 2003). Examples of such artefacts on a regulatory dimension could be procurement contracts with suppliers, on a normative pillar regular meetings and could affect the cognitive dimension on the nature of individual’s relationships with the environment and other individuals (i.e. suppliers), conceptions on the reality of time or space (Gagliardi, 1990). Social contracts can equally be examined as social artefacts (Scott, 2007).
3.2.1 The basic framework

Following the in-depth description of the three institutional dimensions and carriers above, the complete conceptual framework developed for this research is presented in Figure 2. Moving from the legally sanctioned to the morally governed and culturally supported, the framework adopts Scott’s regulative, normative and cultural-cognitive institutional dimensions, to allow a more holistic perspective to innovation adoption. As highlighted by Richard Scott, the various institutional facets should be regarded as mutually reinforcing and interdependent within their particular context of a social system. Hence the rules, norms and cognitive meanings work in conjunction to exhibit the strength and resilience of social structures. However, due to their complementing nature, the three dimensions need to be distinguished by differences in the underlying guiding assumptions, mechanisms of conveyance and indicators. Scott presents 7 key descriptors which elicit the different components and characteristics of each dimension, which are: 1) the basis of compliance, 2) basis of order, 3) Mechanisms of conveyance 4) the underlying logic of each dimension, 5) indicators, 6) Affect, referring to the emotions evoked by each pillar, and 7) the basis of legitimacy (Scott, 2008;51). The descriptors elicit the underlying assumptions and competing arguments which define each dimension in relation to each other and are illustrated in Table 1 below.
The three institutional dimensions are highly interdependent and may be supportive or even reproductive of each other or they are in conflict with another. In the first instance social behaviour and practices are mutually reinforced through taken-for-granted elements of cultural cognitive elements, normatively endorsed and imposed through regulative arrangements. The three elements therefore continuously move “from the conscious to the unconscious, from the legally enforced to the taken for granted” (Hoffman, 1997:36). Institutions therefore are relatively resistant to change, yet can are developed, maintained and reproduced through over time through each of the elements (Scott, 2008: 48-49). It is therefore important to take into account the interplay between the three dimensions and external intermediary variables as a means to understand the underlying explanatory factors that drive a certain adoption behaviour.

Most importantly, this research combines Scott’s three institutional dimensions with a multi-institutional perspective of exogenous and endogenous set-up. Public organisations, such as the UK NHS, are highly institutionalised and complex systems that exist and operate at different levels and forms (Currie, and Guah, 2007, Party, 2010). Due to the complexity and vastness of the NHS, the framework applied for the purpose of this thesis therefore further distinguishes between three main levels of analysis of external and internal factors, notably (1) the endogenous health organisation, (2) the exogenous NHS system and (3) the extra- exogenous of the wider EU and National system. The three levels of analysis reflect the evolutionary and changing nature of institutions and play a role in manifesting the various features of the three Scott dimensions encountered (Scott, 2007; Powell, 2007).

### Table 1: Scott descriptors of institutional dimensions

<table>
<thead>
<tr>
<th>Descriptors</th>
<th>Regulative</th>
<th>Normative</th>
<th>Cultural-Cognitive</th>
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<tbody>
<tr>
<td>Basis of compliance</td>
<td>Expedience</td>
<td>Social obligation</td>
<td>Taken-for-grantedness, Shared understanding</td>
</tr>
<tr>
<td>Basis of order</td>
<td>Regulative rules</td>
<td>Binding expectations</td>
<td>Constitutive schema</td>
</tr>
<tr>
<td>Mechanisms</td>
<td>Coercive</td>
<td>Normative</td>
<td>Mimetic</td>
</tr>
<tr>
<td>Logic</td>
<td>Instrumentality</td>
<td>Appropriateness</td>
<td>Orthodoxy</td>
</tr>
<tr>
<td>Indicators</td>
<td>Rules, Laws,</td>
<td>Certification,</td>
<td>Shared logics of action, Isomorphism</td>
</tr>
<tr>
<td></td>
<td>Sanctions</td>
<td>Accreditation</td>
<td></td>
</tr>
<tr>
<td>Affect</td>
<td>Fear, Guilt/Innocence</td>
<td>Shame/Honour</td>
<td>Certainty/Confusion</td>
</tr>
<tr>
<td>Basis of legitimacy</td>
<td>Legally sanctioned</td>
<td>Morally governed</td>
<td>Culturally supported</td>
</tr>
</tbody>
</table>

The first level of analysis is the national (exogenous) institutional level and is concerned with the institutional arrangements at the level of the state and wider system or national level. Here, the analysis focuses on the individual national and NHS system of the two countries under study of Scotland and England. Second, a wider exogenous institutional level needs to be taken into account. This level involves the binding international or system structures, beyond the national institutional set-up, and can equally include regional level of analysis. In the light of this research, extra-exogenous features involve the wider European frameworks and cross-sectoral elements. Finally, the endogenous level of analysis is concerned with the internal institutional set-up of the local organisation, which in the case of this study represents the local health organisations in each national NHS system. The following sections will further conceptualise the link between the different levels of analysis and reflect on the operationalisation of institutional dimensions.

### 3.2.2 Conceptualising the link between ‘exogenous’ and ‘endogenous’ institutions

In order to understand how the exogenous and endogenous dimensions are linked, it is helpful to understand the concept of the organisational field, which is dependent on the multitude of different external and internal interests at stake (Powell, 2007; Hoffman, 1999). For example, regulatory elements such as legal mandates can represent a force at the endogenous level while acting as an exogenous constraint to local organisations (Scott, 2007; Powell, 2007). In previous research, the exogenous environment has been emphasised as an important mechanisms in providing clues and rules about the value of certain practices (i.e. through social ties) which help individuals respond to uncertainty.
and interpret social reality (Thorton, 2002; DiMaggio and Powell, 1983; Davis and Greve, 1997). The endogenous (internal) organisations were argued to act as filters to external institutional pressures, where organisational behaviour is determined by the internal institutional set up (Cyert and March, 1963). As emphasised by Thornton, institutional logics of exogenous and endogenous set-up “link internal mental cognitions to external rituals and stimuli” (2004:41). The institutionalisation of external factors is therefore dependent on the internal ability to interpret and attach meaning to social action, reinforced through symbolic and material rewards, assumptions and values on appropriate behaviour or what constitutes success (Thornton and Ocasio, 1999). The conceptual framework therefore seeks to capture this complexity and variety of organisational responses and role of different institutional environments in co-defining the different features across the three institutional dimensions. The exogenous-endogenous divide in turn helps to identify the explanatory power and importance of each institutional dimension within a particular context (Powell, 2007).

The direct and indirect effects of different institutional environments on the individual organisation structure and internal procurement behaviours may express itself in very different ways. Therefore, in order to understand the institutional structures that govern the ability and willingness of public organisations to adopt innovations it is important to employ a multi-level analysis of the various governance, societal, inter-organisational and internal institutional factors.
3.2.3 Applying Scott’s three institutional dimensions

Due to the highly interwoven nature and interdependency of the three dimensions introduced by Scott, the distinction might prove problematic in practice (Campbell, 2004). While the framework aims to provide a broader and more comprehensive account of institutional analysis among the variety of conceptualisations of institutions, the operationalisation and empirical application of Scott’s three dimensions remains predominantly theoretical. As highlighted in the literature, there have been limited attempts to fully apply Scott’s three dimensions of the institutional framework within contextualised empirical settings (Mizruchi and Fein, 1999). In particular, the distinction between the normative and cultural-cognitive institutions has been argued to be difficult to distinguish and operationalise in practice, since the two dimensions are conceptually close to culture (Devinney, Pederson and Tihanyi, 2010). Nevertheless Scott’s regulative, normative and cultural-cognitive dimensions have become one of the most-cited contributions in the institutional literature and offer a platform for further work. As emphasised by Scott, the cultural-cognitive dimensions provides “the deeper foundations of institutional forms [and] infrastructure on which not only beliefs, but norms and rules rest” (Scott, 2004:5). Hence, Scott highlights the need to further specify which dimensions operate at different levels and explore how they inform and which effects they have on organisational behaviour (Scott, 2008). Therefore, this research seeks empirically apply and explore the well cited analytical framework of Scott, while taking into account the broad range of different external and internal institutional factors and their interactions. The framework served as a basis for establishing predictions and explanatory factors of organisational adoption behaviour. Taking into account the evolutionary and interactive nature of innovation learning processes, the findings of this work contribute to the better formulation of framework conditions and predispositions of innovation processes. With the help of the comprehensive multi-dimensional conceptual framework described above, this research seeks to empirically explore the three dimensions within multiple case studies as a means to further contribute to operationalise the distinction and application of each dimension.

3.2.4 Revisiting the research questions

The objective of this research is to identify the various institutional features which emerge as most “important” in the adoption process and to derive a more in-depth understanding of the interplay of the various institutional factors and dimensions that shape the willingness and ability of organisations to buy and use innovation. The main research question can therefore be divided into two further sub questions to this research:
Q1. **What are the different types of institutional features which impact on the adoption of innovation technologies?**

1.1. What are the particular exogenous institutional features on the regulatory, normative and cognitive dimensions that affect the adoption of innovation?

1.2. What are the specific endogenous institutional features in terms of the regulative, normative and cognitive responses that affect innovation adoption processes and how do these features influence the procurement and adoption behaviour of health organisations?

Q2. **How do different types of institutional arrangements affect the willingness and ability of organisations to adopt innovation technologies?**

2.1. *How does the interaction between the exogenous and endogenous institutions affect the adoption of innovation technologies?*

The project seeks to demonstrate that institutional structures and their interaction make a difference in innovation adoption processes of organisations. It applies a holistic concept that allows a differentiation between exogenous and endogenous institutions and a differentiation in three different dimensions of institutions. The study is underpinned by the assumption that a better understanding of the underlying institutional contexts could significantly contribute to more effective adoption processes and policy making in the future.
Chapter 4: Methodology & Research Design

4.1 Epistemological standpoint: A ‘Critical Realist’ perspective

Before presenting the specific research design adopted for this project, it is necessary to define the philosophical standpoint underpinning this research as a means to maintain coherence in theoretical and empirical research and enhance the internal validity of the research (Punch, 2005). Challenges in research were particularly highlighted in relation to the use and empirical application of theories, subject to the variable, complex and open nature of organisations and their contexts (Astley and Van de Ven, 1983; Fabian, 2000). This research employs a Critical Realist perspective to explore the role of institutions and relationship with the adoption of innovation (Sayer, 1992). The application of Critical Realism is particularly suitable to the study of the complex nature of innovation processes and institutions, allowing to understand the underlying meanings and causal mechanisms underpinning social phenomena as opposed to positivist approaches which seek to establish universal regularities or predictions (Sayer, 1992; Danermark et al, 2002). Hence, this philosophical stance views social reality to be derived from the underlying structures and mechanisms through which events and actions are generated (Bhaskar, 1989). In turn, the philosophical stance of this research will help to evaluate knowledge according to the explanatory power and practical adequacy of variables explored, in contrast to the establishment of patterns in positivist perspectives such as strict falsification (see Popper, 1959).

The application of a Critical Realist perspective in this research has two major methodological implications: first of all, the research philosophy reflects the importance of analysing social phenomena within their real life contexts (Sayer, 1992). This research therefore reflects an open systems perspective of an emergent reality, shaped by the various actors, institutions and cultures of a system (Dogson et al., 2011). By looking at the English and Scottish NHS, this research aims to understand the role of different institutional structures on the uptake of technological innovations. Hence this particular interplay between actors, processes and structures behind the innovation adoption process can be explored. Secondly, this thesis will be underpinned by notions of induction and deduction, moving from merely descriptive elements of empirical work, in establishing the underlying conditions and casual mechanisms which shape the social phenomena under study, to the analysis of phenomena against the established institutional dimensions of
conceptual framework (Easton, 2010). The research will therefore be able to reflect the events and actions within its particular context, following a descriptive reconstruction of the event in the form of Narratives, and finally present an explanatory analysis of the underlying factors and mechanisms which drove social behaviour and actions.

4.2 Comparative Case Study design

4.2.1 Research strategy: Approach and techniques for data collection and analysis

For the investigation of this project, a qualitative case study approach is applied, drawing on multiple NHS procurement cases in the Scottish and English system. Due to the exploratory nature of the topic, the use of a case study research approach is regarded as a suitable method for “investigat[ing] a contemporary phenomenon in depth and within its real-life context” (Yin, 2014; 2009, p.18). Case study research facilitates the investigation of “how” questions which do not necessitate the control of behavioural events (Hartley, 2004). The case study framework draws on Yin’s “multiple units of analysis” opposed to holistic “single-unit of analysis” (2009). The evidence collected through multiple units of analysis is often considered as more compelling and robust (Herriott and Firestone, 1983; Yin, 2009). Therefore adopting a multiple case analysis in this project will help to capture a richer and more informed set of data within different contextual settings. Following the inductive-deductive interplay of the project, a conceptual framework has been developed in ‘Chapter 3: The Conceptual Framework’ (‘section 3.2.1 The basic framework’) as a means to allow for a more systematic approach to the study of innovation adoption and will be used as a framework for investigation of the context research and case studies. The use of a data triangulation approach of semi-structured interviewing, document and archival research, further strengthens the validity of the findings (Yin, 2009).

It is a multiple case analysis in attempt to adopt three different innovative technologies both in England and in Scotland. The reason for adopting the two NHS systems for this research is based on the assumption (ex-ante) that both contexts represent different exogenous institutional configurations. In broad, the English NHS system represents a more deregulated institutional system, incentivised by regulative and normative pressures of competition, while the Scottish NHS system is characterised by a more integrated institutional structure with higher levels of central involvement. The latter incentivises for collaboration and collective NHS culture. By comparing and contrasting the findings of multiple case studies across different institutional configurations, the analysis will allow to assess the underlying meaning behind the various institutional features and organisational
The following table presents an overview of the empirical work undertaken for this research, including the method of investigation, time frame, and number of interviews. Overall, two main empirical stages can be distinguished. First of all, the work comprised of a context analysis on the NHS exogenous institutional dimension involving 12 face-to-face interviews innovation and procurement experts in the English and Scottish NHS system. The aim of the context analysis is to analytically capture the key institutional features on the exogenous dimension deemed as important in the adoption of innovation, as well as serving as a basis to identifying common adoption patterns and potential procurement cases within each NHS system. The second stage involves in-depth investigations of six procurement cases, comprising of 6-7 interviews per hospital case. The aim is to analytically capture the institutional features deemed as important in the adoption processes of local organisations under study. The cases comprise of three parallel investigations of the same medical technology in both NHS systems in order to avoid potential technology related adoption bias. The findings from the context and case studies will further serve to iteratively re-inform the underlying conceptual framework derived on the basis of the literature.

**Table 2: Data Collection Overview**

<table>
<thead>
<tr>
<th>Details of Data Collection</th>
<th>Context Analysis</th>
<th>Case Study Investigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Collection Methods</td>
<td>Face-to-face interviewing; group interviews; document/archival research</td>
<td>Face-to-face and telephone interviewing; observational/participation data; document/archival research</td>
</tr>
<tr>
<td>Number of Interviews</td>
<td>12 interviews (6 interviews in each NHS system)</td>
<td>40 interviews (6-7 interviews per individual hospital case)</td>
</tr>
<tr>
<td>Length of Interviews</td>
<td>60-120 minutes</td>
<td>40-60 minutes (with additional 60-120 minutes observation/participation when access granted)</td>
</tr>
<tr>
<td>Respondent organization</td>
<td>Governmental organisations; regulatory bodies;</td>
<td>Hospitals; National regulatory organisations; Supplier organisations;</td>
</tr>
<tr>
<td>Respondent description</td>
<td>policy makers and procurement experts</td>
<td>Clinicians, Procurement/Medical physics practitioners; Management &amp; Finance Directors; Nurses; Facilitator roles (i.e. innovation experts)</td>
</tr>
</tbody>
</table>

For the analysis of the case study data, qualitative coding was applied as a means to identify key themes and categories in relation to the presented conceptual framework to form the basic units of analysis. This process was of iterative nature, encompassing a first-level analysis of broad key themes against mainly the vertical variables of exogenous, endogenous and horizontal analysis of regulatory, normative and cultural-cognitive categories. This was
followed by the labelling and clear description of sub-categories and conceptualization within each of the core institutional dimensions (Denzin and Lincoln, 1994). Examples of sub-categories in this research are in the regulatory dimension the ‘rules and laws’, ‘governance and authority systems’ or normative ‘norms’ or ‘values’ and cultural-cognitive sub-categories of ‘identity’, ‘roles’, ‘isomorphism’ to name a few. Due to the aim of this research to identify the relationship between institutional variables, the process of coding further drew on the use of Axial coding, which involved identifying connections between the various categories identified as a means to make sense of the reciprocal relationship of factors. The two processes have been defined as the “search for patterns in conditions and processes” and the “integration of these patterns” into clear relationships and concepts within an interpretive and systematic process with the aim to reduce the complexity of information and reduce into clear conceptual explanations (Glaeser, J. and Laudel, G., 2013).

4.2.2 Case selection and sampling criteria

Due to the vast nature of the subject as well as the large size and variety of the selected research context, this study focuses on only a limited number of organisations and types of innovation technologies. Research subjects in this study have therefore been selected on the basis of “purposive sampling”, as a form of non-probability sampling and one of the most common techniques in qualitative research (Miles and Huberman, 1995). The context interviews have been selected on the basis of three main criteria, namely (1) the level of experience in the field of innovation or procurement in the NHS, (2) accessibility and willingness to participate, (3) role or involvement in the English or Scottish NHS system. For the selection of hospitals for the case studies a number of important elements were taken into consideration. First, the time of adoption played a role, which further links to problems of accessibility as individuals involved in the adoption process may be retired, non-accessible for other reasons or retain poor recollection of adoption if the event dates back too long. Interviewees within the cases then in turn were selected through a combination of purposive and snowball sampling technique, through previous interviews to ‘explore’ the involvement of different types of actors in the decision-making process (Miles and Huberman, 1995). The reason for this is that organisations may be highly variable in the types of roles and interests individuals may hold in innovation adoption. Figure 3 below presents an overview of the types of interviewees identified on the context and case study level for the purpose of this research. Finally, factors of accessibility and validity played an important role in the selection of cases to allow the materialisation of adequate data and material for analysis and comparative elements. Hence the hospitals were selected on the basis of the type and innovativeness of the technology (level of disruption) and on the case’s ‘replicability’ of in the parallel country of focus (English or Scottish NHS). The latter particularly focused on identifying a hospital in both NHS systems
A number of routes have been pursued for the identification of suitable case studies for this research, which can be summarised into three main stages: the first and ideal route of hospital case selection was through snowball sampling in the context interviews. However, this method was faced by two main challenges: the awareness of local adoption activity was relatively limited at system-level and other issues surrounded problems of sensitivity in share recent adoption cases to third parties without direct consent. For these two reasons, two further selection routes have been pursued, which involved more systematic exploration of hospitals. The second route involved establishing a large database of Health Boards in Scotland and Hospital NHS Foundation Trusts in England, to be contacted by email and follow-up interviews. Finally, through the attendance of various conferences and events, the final case selection route was through the supplier of the new technologies. The latter was mainly applied as a means to identify the second “couplet”
case for the adoption of the same technology in the other NHS system for parallel investigation.

4.2.3 Interview design

For the design of the interviews the type of interview method and questions needed to be established, particularly depending on the degree of flexibility and data collection stage of the research (Turner, 2010; King, 2004). Inherently there are three broad types of interviews, ranging from the more ‘closed’ types of questions in fully-structured interviews, to more flexible yet pre-determined questions in semi-structured interviews where the sequence and wording can be altered according to the interview context and finally to open-ended and in-depth unstructured interviewing, which typically does not involve a set of specific questions (Robson, 2002; Cohen et al, 2007). For the purpose of this research semi-structured interviewing was employed for all interviews. The interviews were looking to explore the adoption processes from the perspective of the interviewee where the purpose of the questions were only to guide the interviewee in the types of topics to be explored. For this reason the interviews consisted of a set number of broad themes and prompts to be explored to allow such flexibility rather than a strict set of questions or structured interview protocols. The interview themes and questions, however were adapted according to the role, background and NHS system of the interviewee.
4.3 Research quality: validity, reliability and generalisability

Due to the use of a case study research design, the research quality needs to be verified according to the test of construct validity, reliability and generalisability (external validity).

According to Yin (1994) construct validity refers to the validity of operational measures applied for the study of concepts, to reduce the risk of subjectivity in research findings. In other words, construct validity signifies the extent to which a methodological procedure leads to an accurate “objective” observation of reality (Denzin and Lincoln, 1994). An important research strategy to ensure construct validity of case study research is the use of triangulation of different sources of data. This research therefore undertook multiple case studies by drawing on multiple sources of data, combining interview data with archival documents, and observation, as a means to adopt different angles from which the phenomenon is studied (Denzin and Lincoln, 1994; Pettigrew, 1990; Yin, 1994). Furthermore, construct validity can be also achieved through reviewing interview transcripts and drafts of case study narratives with key informants (members of the researched organisation) for consistency and accuracy.

4.3.1 Generalisability (External Validity)

The generalisability of research finding has been a major critique of qualitative case study designs, and has been defined as the extent to which the findings can be generalised “beyond the immediate case study” (Yin, 1994:35). One might argue that generalisability is not the main purpose of qualitative research due to the focus on investigating a phenomena within its particular context. However, generalisability in qualitative case study research can be achieved in two main ways: (a) analytic generalisation rather than statistical, where “the investigator is striving to generalise a particular set of results to some broader theory” (ibid.:36); and (b) the degree to which research findings are applicable to other populations or samples (Ryan and Bernard, 2000). First, in the light of this research, analytic generalisability is achieved through relating the research findings to a robust and comprehensive theoretical framework, discussed in ‘Chapter 3: The Conceptual Framework’. The framework has allowed for the systematic investigation of research data, which can be applied on future research investigations and contexts to achieve analytical generalisation. Secondly, as argued by Yin the use of a multiple-case study research design is considered as a more compelling and robust alternative to single-case studies (Yin, 2008; Herriott and Firestone, 1983). The comparative element of the
case studies help to augment the potential population to which its findings can be generalised to.

**4.3.2 Reliability**

Reliability refers to the extent to which research results are consistent over time and can be replicated or repeated in the future (Denzin and Lincoln, 1994). Silverman defines reliability as “the degree of consistency which instances are assigned to the same category by different observers of different occasions” (2005:210). However, most case study research is dependent on the particular context under which the phenomena is investigated. While no research can be fully free from underlying assumptions that guide it, a number of strategies have been identified to increase the reliability of data. In the light of this research, all interview data has been tape-recorded and fully transcribed by the researcher as a means to reduce the error of interpretation, guided by a case study protocol with interview themes (see Annex 5: Interview guide for the context analysis and Annex 6: Case study protocol: interview themes for case study participants). Furthermore, transparency and reliability of data was further enhanced through the in-depth description and application of a conceptual framework. The conceptual framework has allowed to systematically analyse the case study findings and will facilitate the replicability of research findings through the use of the framework.
Chapter 5: Context Analysis – The English and Scottish NHS system

5.1 Overview of the English and Scottish NHS system

Drawing on the assumption that the wider national framework conditions and institutional set-up play an important role on the adoption behaviour of organisations, this chapter provides a detailed description of the English and Scottish NHS system under study. Since its foundation in 1948, the evolvement of the NHS illustrates the impact of external institutional context in shaping the way healthcare services are performed and structured across the different countries England, Scotland, Wales and Northern Ireland (NHS Confederation, 2012). Each system therefore operates independently to each other and is politically accountable to the relevant government. Reflecting on the demographic and administrative conditions of the countries, each NHS system has developed its distinctive priorities, internal structures and processes that shape the way organisations perform and deliver healthcare services. As the two largest healthcare systems in the UK with a history restructuring and devolution since 1999, the English and Scottish NHS systems present a good basis for analysis to apply and operationalise Scott’s three institutional dimensions. The aim of this chapter is to present an overview of the two NHS systems, drawing on Scott’s regulative, normative and cultural-cognitive variables as a means to establish wider institutional national framework conditions. The chapter is structured as follows: (1) the two NHS structures will be described and compared, (2) the national framework conditions will be analysed and discussed in the light of Scott’s three institutional dimensions, and finally (3) an overview of the procurement systems will be presented followed by (4) a discussion on the role and use of innovation in the two NHS systems.

5.1.1 The English and Scottish NHS structure

This section presents an overview of the current English and Scottish NHS structures since devolution in 1999, drawing on the key national bodies of regulatory importance in the two systems. Following an overview of the main accountability and power structures in each system, a summary of the main roles and responsibilities of the key organisations can be seen in Figure 5. It has to be noted that the illustration of the English NHS system presents the structure of the former organisation structure prior to the structural reorganisation in 2013. Since the empirical work was undertaken during the period of transformation (2008-2013) the cases represent the former organisation NHS structure (DH, 2010; NHS Confederation, 2012).
As can be seen from the two NHS structure illustrations above, the English NHS system depicts a highly bureaucratic yet more devolved NHS structure, with multiple independent regulatory organisations which can be divided into three tiers of governance (DH, 2001). On the first tier sits the Government with the Department of Health, responsible for making political decisions and deriving policies to support healthcare provision. The responsibility for service provision and development is held by the Secretary of State for Health in England and the Minister for Health and Community Care for Scotland (Harker, 2012; Galloway, 2010). This is supported by the Department of Health in England, which is directly accountable to the Parliament through the Secretary of State for Health, however accountability equally exists towards the public (McCay and Jonas, 2009). This reveals the role of public voice and service experience as an important external evaluator of public services and is anticipated to play an increasingly important role nationally and locally to hold organisations in account for their performance.

The second tier refers to the Strategic Health Authorities, responsible for converting policy into national strategies for supporting and managing the performance of healthcare organisations. In the period relevant for this analysis there have been a total of 28 Health Authorities ranging from a number of different specialties services, such as family health, blood and patient safety. Finally, the third and lowest tier incorporates the Primary Care Trust (PCTs) and delivery bodies for the NHS through primary and secondary care. The healthcare providers (hospitals) are in turn indirectly regulated by external organisations which sit arm’s length to the central Government, such as Monitor and NICE who are responsible for guiding and regulating local Healthcare provision. With a total of 151 PCTs in England responsible for managing local health budgets, the provision and purchase of healthcare services is fairly individualised to local health organisations (Edwards, 2011).

The main function of the PCTs is to commission contracts for service provision across primary and secondary care, focusing on purchasing services from healthcare providers to meet local and national requirements through national tariff rates. While the tariff rates are nationally agreed on the basis of the average reported cost for different type of services, the tariffs are locally agreed by the PCTs according to the types of services and number of patients treated at health providers. This in turn indicates the potentially inconsistent local funding structures for local hospitals, highly dependent on local service provision and demographics as well as the hospital’s capability and skill in negotiating new tariff rates with commissioners (NICE Online, 2010). The hospitals are therefore directly accountable to the regional PCTs in demonstrating targeted performance and hospital status as a means to achieve higher funding accreditation for new services. The purpose of the tariff arrangement is to allow price competition among providers, seeking to overall lower the charge of healthcare procedures in the long run (Edwards, 2011).
Source: Galloway, 2010; Robson, K. 2011: Current Organisation of the NHS in Scotland
In relation to the Scottish NHS system, the chart depicts a more streamlined and centralised structure, with direct reciprocal feedback and accountability lines to central government. In contrast to the English NHS structure, the Scottish Government holds stronger levels of responsibility on the distribution of resources and setting national objectives and priorities on behalf of all 14 Health Boards in Scotland. The NHS boards on the other hand are responsible for multiple NHS functions, including planning, commissioning and delivering healthcare to their populations through local hospitals, community health services as well as GP practices and pharmacists who work as independent contractors to the NHS (NHS Scotland, 2015). Finally, the health services are further supported by cross regional health partnerships and community and social care partnerships who ensure the close involvement of local authorities, health providers and the public (Ibid., 2015). The Scottish NHS is therefore characterised by a more collaborative and integrated approach than the English NHS, promoting regional and national collaboration on the planning and commissioning of health services (NHS Scotland, 2007). With this the Scottish Government has more participatory power and influence in how local healthcare services are organised through communicating and implementing the national agenda and strategies to regional and Local Health Boards (LHB). This is a very important aspect which differentiates the English NHS from its Scottish counterpart, where collaboration and collective decision-making is favoured. According to a recent publication by the NHS Department of Health, competition and collaboration are two fundamentally conflicting principles, where simultaneous implementation of the two is claimed to hinder communication links between commissioners, providers and local authorities (Partnership for healthy outcomes Report, 2012). While Scotland promotes the notion of cooperation and partnerships, NHS bodies in England increasingly engage in court challenges (ibid, 2012).

In the case of the new English NHS structure the PCTs will be abolished and replaced by a new Government independent NHS Commissioning Board and GP Consortia Groups led by groups of general practitioners, who will hold the responsibility to manage the £100bn NHS budget to purchase public and private healthcare services on behalf of the NHS (DH, 2010). The changes in the NHS therefore strive towards further deregulation and a more bottom-up approach, through delegating funding responsibilities directly to the health practitioners to achieve decision-making closer to the patient and local communities (DH, 2010). The GP consortia is held into account through the NHS Commissioning Board who is responsible for developing commissioning guidelines, model contracts and tariffs. The NHS functions of the Department of Health will therefore be radically reduced, for further delayering and strengthening of responsibilities among a wider group of organisations, such as the NHS Commissioning Boards, Monitor and the Care Quality Commission (DH, 2010). The new structure was aimed to be put into effect from April 2013, which however
was after the procurement cases under study took place and were therefore not affected by the changes. In the subsequent sections, the two healthcare systems will be systematically analysed according to the regulatory, normative and cultural-cognitive institutional features to establish a more in-depth understanding of the distinct national framework characteristics, with particular attention to national procurement and innovation systems. Further to this, the Parliament also holds the Department of Health into account for spending tax payer’s money and the overall operation of the NHS. All government departments are additionally inspected by a support body called the National Audit Office (NAO) which assesses the Department’s accounts for the overall efficiency and effectiveness of the use of public funds (McCay and Jonas, 2009).

5.1.2 Regulatory environment in the English and Scottish NHS

This section presents a short overview of the regulatory environment of the English and Scottish NHS systems, divided into three main parts. First of all, it describes the key rules, laws and governance systems on national and extra-exogenous (supranational) level, followed by the national funding arrangements for healthcare provision. Finally, particular attention will be paid on the individual procurement and innovation systems in the two countries, establishing an understanding of the relative regulatory environment and role of both procurement and innovation in both systems. Table 3 below summarises the main findings from the documentation and context interviews organised according to the conceptual framework and will highlight the features which are perceived as making a difference to the adoption of new medical devices in both NHS systems. The subsequent sections will explain the findings in more detail.
## Table 3: The English and Scottish NHS exogenous institutional features from the context analysis

<table>
<thead>
<tr>
<th>Institutional dimensions</th>
<th>Regulative</th>
<th>Normative</th>
<th>Cultural-Cognitive</th>
<th>Regulative</th>
<th>Normative</th>
<th>Cultural-Cognitive</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>English NHS Context</strong></td>
<td></td>
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<tr>
<td>Shared cross-national or system level features</td>
<td>· FDA product approval</td>
<td>· CE marking (ineffective i.e. metal to metal hips) (Procurement Expert 2)</td>
<td>· EU procurement law &amp; OJEU</td>
<td>· Conflict between incentives for competition and collaboration (Procurement Expert 2)</td>
<td>· Strong levels of local differentiation between hospital structures, priorities and incentives (Procurement Expert 2)</td>
<td>· Top-down budget allocation to local health boards (National Resource Allocation Committee, NMAC) (Innovation Expert 3)</td>
</tr>
<tr>
<td>National level features</td>
<td>· Decentralised funding through PCTs (Harrier, 2012)</td>
<td>· NICE Clinical guidance</td>
<td>· Perceived competition’ between healthcare providers, driven by patient choice (Innovation Expert 7)</td>
<td>· Bottom-up approach decision-making opposed to central control (Procurement Expert 2)</td>
<td>· Bottom-up decision-making on national outcomes</td>
<td>· HEAT Performance targets on national outcomes</td>
</tr>
<tr>
<td>Procurement</td>
<td>· No national procurement route, ‘disjointed’ procurement (Procurement Expert 2)</td>
<td>· Supply chain works on pure local demand basis (Procurement Expert 2)</td>
<td>· National Procurement route for centralised support and contracting (Innovation Expert 1)</td>
<td>· NHS Supply Chain as external contractor, described as ‘passive procurement’ (Innovation Expert 2)</td>
<td>· Cost reduction expectations of new products (less focus on waste and quality) (Procurement Expert 3)</td>
<td>· Directed CAP panel membership of local health boards (Commodity Advisory Group) (Innovation Expert 2)</td>
</tr>
<tr>
<td>Innovation</td>
<td>· National Commissioning for Quality and Innovation (CQUIN) Payments are national incentives to reward excellence in innovation and quality at local organisations (Innovation Expert 8)</td>
<td>· Peer pressure as main driver of innovation (Procurement Expert 2)</td>
<td>· National Procurement route for centralised support and contracting (Innovation Expert 1)</td>
<td>· Wireless Report: first to capture slow adoption’ in NHS</td>
<td>· Direct-supplier-clinician relationship (bypassing hospital processes) (Innovation Expert 4)</td>
<td>· NICE report “first attempt to look at innovation infrastructure and behaviour” (Innovation Expert 4)</td>
</tr>
<tr>
<td></td>
<td>· Darzi report as first attempt to look at innovation infrastructure and behaviour (Innovation Expert 4)</td>
<td>· Lack of demand for innovation by NHS Trusts (Procurement Expert 2)</td>
<td>· National Procurement body criticised for not incorporating enough innovation (Innovation Expert 1)</td>
<td>· NHS NICE guidelines on product performance and clinical effectiveness (Procurement Expert 2)</td>
<td>· Trend in adopting ‘new’ non-evidence based medical equipment (i.e. metal to metal hips) (Procurement Expert 2)</td>
<td>· McClelland review offers a regional perspective on innovation adoption (Innovation Expert 7)</td>
</tr>
<tr>
<td></td>
<td>· Strong risk perception nationally in making decisions on behalf of local health boards (Innovation Expert 1)</td>
<td>· Lack of prioritisation centrally and locally on innovations (Innovation Expert 1)</td>
<td>· Relationship between supplier and clinicians more restricted due to stronger integrated decision-making loop within hospitals</td>
<td></td>
<td>· Sense of competition on leading edge and best performance driven by media and peer pressure (Innovation Expert 1)</td>
<td></td>
</tr>
</tbody>
</table>
5.1.2.1 Regulations, governance and power systems:

In relation to the overall governance and accountability systems across the two systems, the relationship between the Scottish Government and NHS boards is described as an “unspoken democratic accountability” (Innovation Expert 1_Scotland). This relationship is further reinforced by the general employment structure: Health authorities are appointed by the ministers and NHS board chief executives are appointed by the board itself, with direct accountability to national policy targets (Innovation Expert 3_Scotland). Therefore the NHS Scotland experiences a stronger level of compliance of the health boards, fundamentally due more streamlined accountability and monitoring systems than the English NHS. Further to this, the NHS health boards in Scotland are equally held in account with several command and control policies and a high level of scrutiny from media and an unusually close involvement of ministers. One of the respondents described the NHS environment in Scotland as “creating a goldfish bowl type media and public view of the health service, so politicians and particularly ministers are constantly involving themselves in a way that I think is not known in England” (Innovation Expert 1_Scotland). England on the other hand is characterised by a much more complex jurisdiction, with no direct control of the government Department of Health (DH) in the performance of local NHS Trusts (Innovation Expert 4_England).

Respondents in the English NHS described the problem in directing health organisations as the decentralised policy and culture does not allow the use of “should or must” but emphasises the use “could” as a means to facilitating and encouraging change through a much more bottom-up approach, opposed to top down (Innovation Expert 4_England). One of the reasons for low levels of vertical accountability and control by central government could be due to the high number of different and independent regulatory bodies in England, such as Monitor who are responsible for regulating Foundations Trusts, the Care Quality Commission (CQC) for NHS Trusts productivity monitoring, to name a few (Procurement Expert 2_England). In contrast, Scotland is characterised by a stronger cohesion of national and regional structures and is closer to unification of services than it is in England (Innovation Expert 1_Scotland). England on the other hand experiences a high level of structural isomorphism, characterised by independent financial instructions, priorities and standing orders at Trust level (Innovation Expert 4_England).
5.1.2.2 National funding arrangements

The funding structure is a strong indicator of the overall degree and direction of accountability between health organisations and the government. While both NHS systems are funded through public taxation, the overall allocation and distribution of health funds to local health organisations is organised differently between the two NHS systems. The responsibility for the local health budgets are distributed across a number of different organisations, responsible for the supervision, monitoring and commissioning of healthcare services. For instance 80% of NHS funding is allocated by the government to the PCTs who in turn are given the power to allocate or "commission" healthcare services to selected hospitals against local and national targets (Harker, 2012). In Scotland on the other hand budgets are directly allocated by the Scottish Government to LHBs through the National Resource Allocation Committee formula (NRAC) based on demographics and local population. As one of the respondents formulated this funding relationship as “health boards are given an envelope of money to perform their duties” (Innovation Expert 1_Scotland). This means boards are directly accountable to the allocation of services by the government, opposed to England where PCTs are responsible for the direct allocation of budgets and services. In addition, due to the deregulated nature of the English NHS market PCTs are increasingly purchasing healthcare services from independent private and voluntary sectors, which creates a sense of competition and pressure for local NHS organisations to compete on commissioning (Harker, 2012). The funding structure in England is foreseen to become even more locally driven by shifting commissioning responsibility to the GPs (ibid, 2012).

5.1.2.3 The procurement systems in the English and Scottish NHS

First of all, in relation to the rules and regulations related to the procurement processes, the two systems are subject to the European-wide EU Procurement Law concerned with regulating the purchasing activities of public sector bodies across the European Union. The regulation sets out the guidelines on awarding public contracts for products over a certain threshold amount, ensuring transparent and international tendering process. The purpose of the EU procurement procedures is to increase supplier competition in tendering for contracts, as a means to ensure consistency and avoid bias in supplier selection at the local organisations. Due to the high regulatory importance and scrutiny in operating within the EU procurement rules, public organisations ensure strong compliance in carefully applying the processes. Interviewees in the English Department of Health highlighted that organisations tend to respond to strict procurement rules in carefully undertaking the process by focussing on publishing technical specifications opposed to outcome
specifications, which has been argued to hamper innovation. In turn, English NHS procurement merely focuses on complying with national and EU Procurement guidelines and thus reflects a lack of interest in procurement and innovation at local level (Innovation Expert 3_Scotland). The Scottish NHS in contrast indicates a more collaborative approach to procurement, encouraging the involvement of multiple stakeholders in the pre-commercial procurement process as a means to achieve more informed and value for money.

On a more national-scale basis, the two NHS systems are governed by a number of government policies and initiatives to guide and direct procurement decisions at local health organisations. An example of such national guidance is the English National Procurement Strategy “Raising our Game”, providing an interim strategy for promoting the adoption of innovative products with clear evidence of benefits of adoption (DH, 2012). The strategy seeks to address the problem of inadequate procurement spent on innovation at local organisations, currently under target comprising lower than 30% of an average NHS Trust’s total spend. In response to this, the Department of Health set out a total of 19 procurement standards seeking to address the inefficient use of procurement resources, to foster clear accountability lines, stakeholder engagement and transparency, as well as cross-organisational engagement with other trusts. The latter, however, has been argued to conflict with the notion of perceived competition on patient choice and commissioners funding in the English NHS, leading to resistance in engaging in collaborative activities beyond the local organisation.

The Scottish NHS system in contrast focused on reforming the NHS procurement in response to the McClelland Report on the “Review of Public Procurement in Scotland” in 2006 which highlighted the need for more transparent public expenditure and less fragmented procurement infrastructure in Scotland. The report particularly promotes a focus on cost savings and pursuit of best value for money through collaborative purchasing and more streamlined interactions for tendering and contracting activities between organisations and suppliers (McClelland, 2006). Furthermore, Scotland promotes the use of sustainable procurement and Key procurement indicators (KPI), which have to be adopted by all health, boards across Scotland (the Scottish Government, 2013). Respondents highlighted the shared principles of efficiency maximisation and value for money “in terms of low cost” (Innovation Expert 3_Scotland). Other values are encountered in the form of networking and collaboration to achieve efficiencies on price and product variation and waste (Innovation Expert 1_Scotland). Such values and principles are reinforced by the recently published McClelland Report (2011) drawing on the notion of national procurement to achieve savings, wider economic targets and standardisation (Innovation Expert 6_Scotland).
5.1.2.4 National procurement systems

In relation to the national procurement route, the Scottish NHS establishes national contracts through the centralised National Procurement (NP) body introducing the “instruction mandate to drive costs down” (Innovation Expert 1_Scotland). The NP is organised through so-called Clinical Advisory Panels (CAP) which encompass mandatory membership of representatives from each NHS board in order to collaborate on contract requirements. The purpose of CAP panels is to achieve collective buying and “to remove the buyer bias out of the procurement decisions” (Ibid). Hence, the strong partnership approach between NP and local NHS boards has been described as having high levels of engagement of different perspectives. While this approach proves beneficial for communicating local needs and for integrated decision making, the high number of decision makers could result in a slower process (Innovation Expert 1_Scotland). The national body for procurement is primarily involved in establishing contracts on behalf of a large hospital base for a common need, drawing on notions of bundling demand for certain routine purchasing contracts on products characterised by high volume and low cost or high volume-high cost products.

Within the English NHS, the NHS Supply Chain is an independent procurement body on a 10 year contract with DHL to manage the procurement and delivery of healthcare products on behalf of the NHS. However, the body has been described as providing merely “passive procurement” due to the lack of integration of the targets of the NHSSC and NHS Trust demands. The adoption of public contracts therefore involves little to no interaction on local demands and needs, leading to reactively selecting products from the given Supply Chain catalogue (Innovation Expert 1_Scotland). Therefore the national procurement body in England is perceived as an external product supplier to local health organisations, rather than an integrated procurement partner (Bulletin Academic, 2012). Local adoption decisions have been described as an isolated and individual process, indicating a lack of synchrony and communication particularly between national, clinical and procurement departments (ibid, p.8). The English NHS procurement landscape has therefore been described as being merely “disjointed” without any clear control and monitoring structures on local and national procurement (Procurement Expert 2_England).

5.1.2.5 The role of innovation in the English and Scottish NHS system

The following section will describe the innovation systems and incentive structures in each of the two NHS systems in turn.

As described in ‘section 5.1.2 Regulatory environment in the English and Scottish NHS’
above, the fundamental deregulated English NHS structure, leads to a lack of central control on local management and organisation. While the Department of Health is very much aware of various strategies in improving the NHS innovation landscape, the ability of inflicting or commanding change in local NHS behaviour is limited and requires a more bottom-up approach. Hence, the government has created various incentives for improving the adoption of innovation locally. Examples of such incentives are the CQUIN payments, which reward excellent performance in innovation and quality (Procurement Expert 2_England and Innovation Expert 4_England).

Further to this the NHS National Institute for Clinical Excellence (NICE) is responsible for promoting the adoption of innovation through providing clinical evidence and recommendations for key medical devices. However the body is not binding to local organisations, presenting no requirement to organisations to consider the guidance in local adoption decisions leading to the adoption of innovations without clear evidence base. The reason behind the adoption of non-evidence based products is believed to be due to the close supplier-clinician relationship described in the previous section, which may be a result of supplier “lock-in” techniques due to increased buyer dependency on the supplier, as well as the limited procurement and management involvement within the process (Procurement Expert 2_England). The strong clinician-supplier relationship is highlighted by respondents in the ability of clinicians to bypass management and procurement decisions within the process (ibid). Respondents described it as a “trend” to adopt completely new products without evidence base. These findings shine light on the potential lower risk-awareness of local health organisations, than in the Scottish counterpart. This could be primarily due to the de-layered accountability structures and hence more autonomous and local decision-making power.

Respondents in Scotland in contrast report issues in the notion of prioritisation of technologies, based on two fundamental reasons: (a) due to a large number of technologies on the market, and (b) because of the highly integrated nature of the NHS accountability structure (Innovation Expert 2_Scotland). As one respondent describes it, the government “might pick wrong innovations and we might never know if we picked the wrong ones” (Innovation Expert 1_Scotland). The major challenge highlighted in the Scottish context interviews was the identification and adoption of beneficial innovations. Interviews emphasise the failure of a high number of suppliers in Scotland in introducing products into the NHS, highlighting the problem “we are selling in America but not in our home market” (Procurement Expert 1_Scotland). This has been further supported by the
Wanless report published in 2002, capturing the slow adoption in the NHS followed by new reports which seek to address the challenges and set new directions for innovation in the future (i.e. Darzi Report and Innovation Health and Wealth to name a few). In relation to the Scottish NHS system, the adoption has been promoted in the form of improving efficiency and productivity in healthcare services through the NHS Scotland Efficiency and Productivity Programme Delivery Framework (2009) and Healthcare Quality Strategy for NHS Scotland (2010). The frameworks particularly emphasise the effective use of technology as a means to improve the delivery and quality of services. This has been coupled with the McClelland report promoting a more regional and collaborative perspective to the adoption of innovation, seeking to promote more effective procurement of beneficial and supported technologies.

5.1.3 The normative and cultural-cognitive environment in the English and Scottish NHS

Originally the National Health Service is based on a set of common values as set out in the white paper “A National Health Service” in 1944 supporting values of equality, reliability and accessibility of care with the best medical and other facilities available (NHS Confederation, 2012). This means the aim within all four national systems in the UK is to make the best healthcare services accessible to anyone in need irrespective of the ability to pay. For a variety of historical and political reasons, the two systems of interest (England and Scotland) have had very different developments in the basic provision rationales for healthcare (NHS Confederation, 2012; Robson, 2011). Over time each system developed different priorities in relation to the local population and system requirements, leading to differences in values and cultural elements as well as structures and regulations.

In relation to the major normative and cognitive developments between the English and Scottish NHS, it is vital to take into account the differences in the demographic profile of the countries. With a total of 52.23 million people, England serves the largest proportion of the UK population with 83.8%, in contrast to only 5.22 million (8.4%) people in Scotland (NHS Confederation, 2012). NHS England is confronted with much larger and more complex population dynamics, which is a major cornerstone of driving the more deregulated structure with normative feature of competition. While the Scottish NHS promotes values of collaboration and integration in promoting a sense of belonging and collective NHS culture. The demographic differences have therefore been a major factor in driving distinct institutional systems and structures. A further important factor is the national political system of the two countries, influencing the normative and cultural
features in the delivery and management of healthcare. While Scotland has had a strong labour threshold at political level, the NHS benefited from an increased political focus on improving and investing in healthcare services in Scotland. The political position further explains Scotland’s opposition to the competition and internal market regulation introduced in England, promoting normative peer pressures of conformity opposed to competition and differentiation. On the other hand, the English NHS is governed by the underlying ‘privatisation agenda’ introduced by the Conservative Party in England, introducing notions of competition and patient choice. This has been particularly noticeable in the interactions and relationships between organisations at local level, which has been described in the context interviews as reluctance to share knowledge and collaborate across regions. Innovation networks have therefore been argued to not work on a regional basis and shift towards more cross-regional and national network basis, to reduce the element of competition between geographically proximate organisations (Innovation Expert 5_Scotland).
Chapter 6: NHS Procurement Case Studies

6.1 Introduction

This chapter presents the narrative reports of six case studies on technology procurement in two different institutional settings of the English and Scottish NHS system. The cases are organised into pairs of one English hospital and one Scottish hospital cases, and are grouped against a total of three technology probes: The Holmium Laser, a minimally invasive surgical laser device, the da Vinci Robot, as a minimally invasive surgical system, and the Fibroscan, a non-invasive diagnostic tool for measuring the degree of liver scarring. For the development of the case studies, the adoption behaviour of English and Scottish NHS hospital pairs have been investigated against each technology probe, drawing on multiple perspectives of involved decision making stakeholders within each hospital setting.

For each case study report the following key aspects are addressed: (1) the functional use and technical understanding of the technology, (2) an overview of the case context including the hospital background and description of the organisation structure and key stakeholders, (3) the adoption process, including the adoption timeline and key decision making stages, (4) main obstacles encountered and (5) outcome of adoption and impact. The structures of the individual cases may vary according to their unique trajectory. Finally, each case concludes with a brief overview of the key institutional dimensions and factors observed as a means to inform the subsequent analysis of cases. The case couplets will be contrasted and compared according to the following key criteria of the date of adoption, adoption length/speed, origin of idea, and the breadth of final use of the technology (full use/collaborative use/frequency of use), which potentially shine light on underlying institutional factors to be discussed and analysed in the subsequent chapter. The first case below describes case pair of the robotic surgical systems on the adoption at an English and Scottish NHS organisation, followed by the final case couplet of the Fibroscan adoption.
6.2 Holmium Laser (Case 1): Adoption at an English NHS organisation

6.2.1 Technology and supplier

The 100 WATT Holmium Laser (HoL) is a minimally invasive surgical laser device, which can be used for a wide range of surgical specialities, such as the removal of kidney stones, tumours, and the treatment of non-cancerous enlargement of the prostate (HoLAP), referred to as benign prostatic hyperplasia (BPH) (Surgical Lumenis, 2014). The HoL presents a significant advance to traditional laser surgery, such as Holmium YAG laser surgery, Standard Transurethral Resection of the Prostate (TURP) and Open surgery, as highly invasive and less precise techniques. In relation to the higher post-operative risks, traditional lasers risk incurring injuries due to accidental laser contact with surrounding tissues, leading to higher patient discomfort and longer recovery of four to five days (Adams and Pulich, 2014). The HoL, on the other hand, utilises high frequency laser wavelengths of 2.1 microns, allowing to perform precise and clean incisions for the removal of human cell tissue through vaporization (scientific term: ablation). The laser is available in different wavelengths ranging between 20 WATT and 100 WATT strengths, and is one of the first lasers on the market which allows performing a wider range of applications at high laser frequency while assuring safer and more precise procedures (BSC, 2014). Furthermore, HoL waves are highly absorbable by water and liquid, which allows to reduce the risk of unintended tissue damage, facilitating more focused wavelength energy on specifically targeted tissue.

The first use of Holmium lasers dates back to 1994. However as lower powered machines the lasers did not prove strong enough for effective long-duration procedures, which led to abandoning the technique until the launch of the 100 WATT laser in 2001. The 100 WATT laser was the only laser available on the market which allowed for more efficient and larger tissue removal (Krambeck, 2010). The National Institute for Health and Clinical Excellence (NICE) responded to the new development with the publication of the full guidance in England, Wales, Scotland and Northern Ireland in November 2003 (NICE, 2003). The new laser was therefore described as a much safer procedure from a medical perspective, which clinicians were much more comfortable with to perform:

"Lasers in general have been used in urology for prostate surgery for about 15 years. The previous generation weren’t very good. You could destroy tissue with them for the cost of leaving a lot of gaps behind, a lot of low recovery and discomfort went on for quite a long time. But the Holmium Laser doesn’t do that."
It’s much cleaner and from the patient’s point of view is the first laser that does what you wanted to do. (Consultant Urologist_JT)

The supplier of the VeraPulse Holmium Laser, Lumenis, is an American company in the field of minimally-invasive clinical solutions for Surgical, Ophthalmology and Aesthetic markets, for energy-based technologies such as lasers. To supply the UK market, Lumenis has sold the laser through Sigmacon, the sole local distributor of lasers to the NHS and private sector in the UK.

6.2.2 Level of disruption at the adopting organisation

To establish a more balanced understanding of the procurement and adoption process, one has to understand the level of change and disruption the technology caused to the buying organisation, which can be summarised into two closely related points.

First of all, hospital staff had to undertake targeted training for the use and installation of the new lasers in the hospital. Despite the use of previous lasers in the hospital, the use of the HoL required extensive training of key hospital staff to ensure familiarisation with the new procedures. The training was included in the contract of the supplier, offering a number of courses to be attended by key hospital staff, which significantly facilitated the training process. While the device would be primarily utilised by clinical consultants, other hospital staff had to be trained and informed on the safety aspects and usability of the laser was equally undertaken with different hospital staff in the theatres, such as nurses, as a means to form a surgical team for laser surgery. For this the Quality Committee within the Executive Management Board had to be involved in order to ensure immediate implementation of the training at the laser’s arrival at the hospital in June 2012. Furthermore, during the implementation and training period of the laser, the hospital had to employ a laser safety officer to supervise the completion of the training and ensure all safety aspects are covered, including insurance.

Secondly, due to the higher strength of the new device in contrast to former lasers utilised in the hospital, the use of the HoL led to significant changes in culture and attitudes towards the use of lasers in theatres. Clinical staff, in particular, expressed initial resistance towards using the HoL because of perceived safety concerns on the laser’s risk to accidental injury or blindness. Before the device could be fully utilised, the staff had to be reassured and familiarised with the safety procedures:

There was a bit of trauma at the beginning some of the staff were very anxious about the device’s safety. The perception was that the laser beams are going to
bounce in the room and we could blind people, which is true if the laser is used inappropriately you can damage someone’s eyesight. But with this technology the beam only reaches one meter so it won’t bounce all over the room but we had to get staff on board, saying 'yes you are right to have those concerns and we have to follow these safety procedures but there is a reality check. As long as we do everything in the correct manner, everything will be fine.’ So it was about changing those perceptions. (Theatre Manager, Clinical Business Unit)

6.2.3 Hospital background

6.2.3.1 Organisation structure

The hospital is a small 400-bed district hospital located in the East of England, with a total patient population of 270,000 people (Hospital, 2014). The hospital is operated through a regional NHS hospital Trust organisation (also known as Acute Trust), responsible for the hospital’s population service area in the provision of secondary care services. The hospital services are therefore accountable to the NHS Trust, which consists of the Hospital Trust Board and Trust Board Committees. The structure of the NHS Trust and hospital organisation is illustrated in Figure 6 below (Hodgson, 2014).

NHS Hospital Trusts are publicly funded by the Department of Health with budgets held at regional Clinical Commissioning Groups (CCG), which are responsible for the planning, organising and buying of the hospital services. The particular CCG for the case under study is responsible for the funding of four hospitals, as well as community and mental health services, comprising a total patient population of 441,000 (NHS CCG, 2014). Commissioning plans are prepared at the outset of each financial year taking into account a number of key performance measures provided within national guidance documents and the Commissioning Act of the NHS England (CDD, 2013). In the case of changes to patient services, procedures or hospital infrastructures which may affect the current funding plans established, the hospital requires confirmation by the CCG on changing current tariff rates to accommodate potential increases in capital and running costs of new services, treatments or infrastructures.
6.2.3.2 Hospital decision-making process

For the procurement and adoption of new medical devices such as the HoL, various decision making groups at board and hospital management level need to be involved depending on the capital cost of the desired purchase. First of all, less complicated decisions such as replacement, routine or hiring equipment can be taken at the Surgical Business Unit. This group largely consists of the various leads of each Clinical Specialty, as well as the Surgical Wards, and Associate Medical Director of Surgery and Operations from the Clinical Business Unit. The group is overseen by the Chief Executive and Chief Operating Officer. Secondly, decisions on equipment at a capital cost of £5000 to £10000 need to be taken at the Clinical Business Unit (CBU). The CBU provides authorization by the Associate Medical Directors of the various Clinical Units, which includes Surgery, Women and Children, Acute and Specialty Medicine, and Clinical Operations and Support Units (WhaDoTheyKnow, 2013). Thirdly, this is followed by the Executive Management Board for equipment of a capital cost between £10000 and £1 million. The Committee is supported by a number of sub-committees, such as the Quality Committee to oversee the quality and safety of the new procedures.
Finally, decisions involving a capital cost above £1 million need to be authorised by the Hospital Trust Board, which includes the various Board directors within a number of sub-committees such as the Finance, Governance and Audit Committee. Hence, for the adoption of new devices, the request would typically commence at the Surgical Clinical Business Unit for the review of alternative options and for the initial stage of approval. Other Groups that need to be involved are Infection Control, for the evaluation of sterilisation and maintenance aspects of a new procedure and the Capital Planning Group for the tendering and procurement of the equipment. The latter further collaborates with an external Clinical Engineering Department, subcontracted by EBME, a UK based limited company, responsible for the management and maintenance of medical equipment, including investment planning for training and development of staff (EBME, 2014). Due to the high cost of the HoL, the adoption process had to involve the Executive Management Board for final approval. The decision making process and adoption timeline of the Holmium Laser will be elaborated in the following.

6.2.4 The adoption process: Idea, procurement and use of the Holmium Laser

6.2.4.1 Idea of adoption

The idea of adopting the 100 WATT Holmium Laser was driven by a new Consultant Urologist with his employment at the hospital in September 2010 (Hospital, 2014). The initial interest in the technology emerged from the consultant’s previous exposure to the device through his former position at a large acute teaching hospital in the South East of England. In response to the past experience and high exposure of the consultant to different equipment and locations, the Medical Physics team highlighted the hospital’s lack of control over the consultant’s external networks, private sector work or other medical positions:

*I mean the driver was our consultant Urologist. He saw this piece of kit at a hospital I suspect, but don’t forget, very often however we can’t control our consultants on site, they have all got private practices all over BMI or the private sector, so reps can’t get a gist of where they are, here or somewhere else. (Medical Physics Interviewee)*

From his former experience in using the laser, the consultant revealed strong enthusiasm for the impressive results obtained from the procedure, claiming a considerable improvement of the quality of treatment and stability of hospital services. With the start
of the new position at the hospital, the consultant became convinced that the HoL would be of significant benefit to the Urology services and therefore sought to get the laser procured at this hospital. In the following sections, the overall adoption process will be described, including the procurement and use of the technology. An overview of the adoption process and its timeline can be seen in Figure 7 below.

6.2.4.2 Tendering and options appraisal

By the end of 2011, the consultant initiated contact with the supplier to seek more information about the laser and sought to directly approach various groups within the hospital, such as the Urology department and the Trust Board. The consultant presented the case within the Urology Team at a Business meeting in June, 11th 2012. While the adoption was primarily led and induced by the driving consultant urologist, the HoL was positively received and “strongly recommended” by consultant colleagues. However, at the first attempt in approaching the Surgery Clinical Business Unit (SCBU), the request of adoption was received with scepticism and a perceived lack of interest due to the high cost of the device. The lack of interest at the managerial level might indicate significant discrepancy in aims and priorities between the different departments within the hospital, shining light on potential normative factors influencing this trend. Despite the consultant’s experience of the use and improved outcomes with the device, the initial capital cost of £200 000 of the technology was perceived as unaffordable by the financial and operational hospital team. At this stage, the consultant was redirected to the Medical Physics Department within the Capital Planning group in order to undertake the formal adoption process for the device. Due to the high cost of the Laser, the device had to be tendered according to the European Procurement Framework to view potential alternative on the market:

_I became aware when they put a Business Case Forward [...] so it didn’t really follow the way it should have done. [...] Once he started engaging in terms of wanting [the laser], that’s when he bumped into the processes and had to sort of back off somehow and follow the due process. (Medical Physics Interviewee)_
Figure 7: Case 1 – HoL Adoption Timeline at the English NHS Organisation

<table>
<thead>
<tr>
<th>Technology Development &amp; Idea of</th>
<th>Decision-making and Procurement Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultant Urologist joins hospital with previous HoL experience</td>
<td>Involvement of Quality Committee for training (Exec Mgmt Brd)</td>
</tr>
<tr>
<td>Consultant contacts Supplier for information</td>
<td>11th June: BC presented within Urology Team</td>
</tr>
<tr>
<td>20th June: 6 month hiring approval at Surgical Business Unit</td>
<td></td>
</tr>
</tbody>
</table>

Sep-10 | Jan-11 | Jun-12 |

Approach Clinical Business Unit to reassess adoption of laser after the hire. |

6 months hiring period (June - December 2012)

9th January: Approval by CBU |

16th January: Capital Planning Group Approval by the Finance Director

28th February: Executive Management Board Approval

Procurement phase - Laser purchased before the end of the financial year

Sep-12 | Dec-12 | Jan-13 | Feb-13 | Mar-13

75
The tendering process took approximately six months as a means to confirm the pricing and specification against alternative options on the market before approaching proceeding with the hospital’s decision making process. However, the tendering process revealed the Holmium Laser as the only suitable device on the market, which matched the needs of the consultant. Following the tendering results, the Surgical Business Unit was involved in order to discuss possible options for introducing the Laser at the hospital. Despite the suitability of the device, the SCBU deferred the decision to adopt through a six-month hiring contract, approved in June, 20th 2012. The decision to hire was perceived as a cost-effective option at the time due to a lack of available capital funding for the investment.

*There was some reluctance to spend all that money in one go, because [...] the NHS works very much within the limits of finance. Each year there is a certain amount allocated for capital spends and you know when that’s gone, it’s gone. Sometimes decisions are deferred into the new financial year and they can obviously then apply to get some of the money from the next allocation. And I think if I remember right at first it was declined on the basis that the capital funding was eradicated.* (Finance Accountant Interviewee)

The drive for financial savings and operational efficiency has led to a sense of urgency among individuals within the hospital to speed up internal decision making, with little actual interest beyond their own call of duty. This has therefore led to the fast execution of the HoL adoption request, while limiting the financial impact through supporting the hiring option as a pilot scheme to delay the adoption:

*There is a drive for savings and improvements, financial, and therefore [...] everyone is looking to do things very quickly, putting business cases together, making decisions and so on [...] and people move on to different things very quickly [...] once I’ve done my bit of the pie, I can’t be linked with everything* (Medical Physics Interviewee)

**6.2.4.3 Reassessment of adoption**

Following the hiring decision at the Surgical Business Unit, the consultant felt responsible for driving the adoption of the laser by promoting and exercising pressure to convince the managerial level on the purchase of the device. From hiring the laser once per month, the consultant pushed for an increase to twice per month as a means to accommodate the patient capacity and demand for treatment and prove the efficiency of the device. With the help of the hospital finance team, the consultant produced a financial statement based
on a five year plan in order to approach the SCBU to prove the financial viability against the given benefits of purchasing the device instead of continuing to hire. With the positive pilot results and pressure from increased hiring costs, the consultant was able to convince the hospital management to resubmit a new Business Case for the HoL. The laser was in effect promoted by NICE as the new standard procedure for prostate surgery, however, the pilot played a much stronger role to help familiarise the various stakeholders within the hospital with the new procedure and overcome the financial resistance:

“The results of the work that we did were the main factor. And the fact that the work was increasing starting from hiring it once a month we moved on hiring it twice per month [...]. They couldn’t say no because the treatment was working very effectively, all the patients are very happy and results are very good and they had to collectively agree that the treatment was actually benefiting the hospital in the long term” (Consultant Urologist)

The adoption request had to be further reviewed by the Infection Control department for reviewing the equipment’s routine servicing and maintenance procedures. While the supplier company recommended the use of single fibres for the HoL, the department raised concern about the sterilisation insisting for the use of disposable 10x reusable fibres instead. This has led to a further increase in costs. However once the adoption was approved ‘in principle’ by the SCBU, the hospital was supportive of the adoption.

6.2.4.4 Final decision to adopt

With the support of other consultant colleagues and the input of the CPG and the SCBU, the business case was completed to approach the Clinical Business Unit (CBU) towards the end of the hiring period in December 2012. The role of this group was to review the rationale behind adopting the HoL by considering the cost-benefit balance between offering more efficient hospital services and retaining traditional services at lower treatment costs. The support of the Associate Medical Directors (surgical division leads) within the CBU was seen as vital for enhancing the credibility of the proposal to the Executive Board. Once approval by this group was granted on the 9th of January 2013, the remaining decision making process could be completed within the same month. However, before approaching the Executive Board, the financial calculations had to be reviewed and approved by the Finance Director at the Capital Planning Group in order to ensure the comprehensive illustration of calculation to individuals from non-financial backgrounds. Approval at the group was granted on the 16th of January 2013, followed by the Approval by the Executive Management Board on the 25th of February 2013. The procurement department within the Capital Planning Group was then given the instruction by the Board to procure the laser
for the hospital before the end of the financial year of March 2013. Further training sessions for a limited number of staff was provided as part of the purchasing contract. The training involved a total of five to six hospital members, incorporating aspects of safety and equipment handling. From the hiring decision to the final purchase, the adoption process took approximately one year.

### 6.2.5 Limitations to the ability and willingness to procure and use the Laser

The adoption was described to have taken unusually long in comparison to previous cases at the hospital, referring to a number of challenges which had a significant impact on the decision making and final adoption and use of the laser. The main delays on the adoption of the HoL were described to be related to the cost and complexity in training and safety aspects of the technology. While the training was undertaking prior to the hiring period of the laser, the perceived safety concerns of hospital staff has significantly slowed the training process, requiring additional reassurance measures and safety coaching on the use of the laser. Furthermore, with the arrival of the HoL at the hospital after the hiring period, the hospital had to engage in further training activities to fully integrate the laser practice into current hospital services. For this reason, the training was not fully completed at the time of investigation, with approximately three further months of training remaining until completion.

However, besides the training aspects, a number of organisational factors have contributed to the delays in adoption, which can be related back to initial lack of interest at different levels of decision making. The lack of interest in the adoption was particularly observed at managerial level, which led to a six month delay in first hiring the laser prior to adoption as a means to delay investment. This could highlight a number of underlying normative values leading to incongruent goals and incentive structures on the hospital’s performance and services. Clinical perspectives sought to improve hospital services with the laser device by achieving more efficient patient pathways, simplified treatment and improved outcomes. While the laser was promoted as a means to reduce resources and costs, the adoption was delayed due to initial lack of interest on the managerial side. The Medical Physics team in particular highlights the increasingly cost-focused and business approach in the NHS, which led goals of short-term budgeting and financial viability at hospital management level. The heightened financial control was equally seen as a means to reduce the consultant’s autonomy in the hospital:

> *The profit culture got us away really from the surgeons being the main decision makers [...] It’s much more professional nowadays and it’s much more business-...*
**like. Most things now need business cases [...] structured in such a way that they show all the costs, benefits and risks.**

For this reason, the driving consultant had to take the role of facilitating the decision making process through championing the device:

>I made sure is that I attended all the important meetings and presented the case myself at every level so that people would ask questions and to get their satisfaction. That did play a very positive role in the end, and had a positive influence in the end that people got convinced that this was the right way to go. (Consultant Urologist)

Furthermore, due to the mismatch in priorities between the managerial and clinical perspectives, the laser was procured on the basis of a limited number of procedures per year following negotiations with the regional Commissioning Group.

### 6.2.6 Adoption outcomes

The adoption of the holmium laser has led to a number of key outcomes, which can be summarised into three hospital, user and patient factors.

Firstly, from the hospital perspective the new laser was perceived as a significant cost burden to the hospital, resulting into limiting the use of the device to three out of five working days per week. The management’s concern was that the Laser might incur additional costs to the hospital as other clinical specialties raise interest in using the device, which would require additional training and equipment costs:

*The laser is primarily used by the urology team who work 3 days out of 5 at the moment and it is kept it quiet at the moment as we do not want all the clinicians to get excited about the new laser device but it can be used with other specialties if we had the equipment in there.* (Theatre Management, Clinical Business Unit)

The consultant in particular expressed frustration, feeling “handcuffed” in the inability to freely use the new device. On the other hand, the hospital management recognised the role of the new laser in maintaining and attracting new staff and patients, particularly as a means to create greater sustainability within the changing NHS landscape:

*Maintaining and attracting patients and staff, a bit of both. I mean with the NHS at the moment being quite volatile, hearing about private-sector intervention and so on, which possibly make us feel that there is a need for some kind of sustainability within a trust our size.* (Service Manager Clinical Business Unit)
From a clinical and patient point of view, the consultants expressed particular satisfaction with the laser, observing significantly faster patient recovery than previous lasers, and therefore reducing patient stay. From a clinical perspective, the laser was reducing long-term hospital costs, through reducing the number of follow-ups and hospital bed stay:

"In the past the patients would come back to the hospital a number of times which obviously incurs costs. But doing it with the new laser device you can break it up and flush it out and the patients can be discharged within 24 and return a lot less and therefore gives cost savings." (Theatre Business Manager)

The patients were as a result able to receive faster and more effective surgery, with reduced discomfort and post-operative recovery.

6.3 Holmium Laser (Case 2): Adoption at a Scottish NHS organisation

6.3.1 Technology and supplier

The case undertaken at the Scottish NHS organisation equally involves the adoption of a 100 WATT Holmium Laser from the British distributor Sigmacon, as described within the English NHS case above. Prior to the adoption of the Holmium Laser, the Scottish hospital was using the traditional Greenlight laser since 1980s for the treatment of enlarged prostate. As one of the most common types of lasers, the Greenlight technology has become the standard procedure among healthcare organisations to provide rapid symptom relief of benign prostatic hyperplasia (BPH). The technology uses concentrated light stream to produce heat to remove excess prostate tissue either through vaporising or cutting the tissue (Mayoclinic, 2014).

While the Greenlight laser is less expensive than the Holmium Laser device, the former has been associated with limited flexibility in movement and higher patient discomfort due to the destruction of tissue. One of the most common laser surgeries undertaken at the hospital was the Transurethral Resection of the Prostate (TURP), which involves the use of an electrical current to remove prostate sections and has been associated with the risk of fluid absorption in patients with can cause severe complications and potentially lead to chronic illness or even mortality (Gravenstein, 1997). The hospital particularly valued the minimally invasive function of the new type of laser, allowing to perform operations without the need of incisions or spinal anaesthesia (Loughling and Morgentaler, 2007; Mayoclinic, 2014).
6.3.2 Level of disruption at the adopting organisation

For a more in-depth understanding of the procurement and adoption challenge, one has to understand the level of change and disruption the technology caused to the buying organisation, which can be summarised into three key points.

The adoption of the Holmium Laser was accompanied by the organisational drive to improve capacity management at the local hospitals, which led to the need to change the current way of service provision across the two hospitals. The capacity problem was particularly marked by the lack of facilities and bed availability at one of the hospitals, which led to undertaking the new laser surgery at the larger hospital and therefore disadvantaging the patients at the smaller hospital:

This arrangement, quite ironically in a funny sort of way meant that we were actually doing more fit patients at the larger hospital with nice, very good, very safe laser surgery. Whereas over at the smaller hospital we were still doing all the more unfit patients with the more dangerous procedure (Consultant Urologist_JT)

For this reason, the Health Board was mandated by the Scottish Government to reduce the number of beds through reducing the two acute hospitals into one hospital, requiring a change in practice. The HoL played a major role in changing the way of treating patients and was a central aspect to the change in hospital services, reducing bed stay from a total of five days to a day case. The laser was therefore presented as a significant disruptive element to the management and delivery of healthcare at the new hospital.

Before the laser could be procured, the adoption had to be arranged according to the training requirements of the clinical staff. The Health Board was actively involved in agreeing the timeline of adoption, in order to ensure that the laser could be used directly at its arrival to the hospital. The training was arranged for a total of five Consultant Urologists at a two-day course at the Cambridge Holmium Laser Group, followed by in-house training with the help of one-to-one mentoring cases with experienced HoL pioneers. While the mentors were mostly located in Cambridge and Derby, which respondents highlighted as posing difficulty in the mentors’ responsiveness, the consultants emphasised appreciation for the mentor’s collaborative commitment. While the clinical professionals were already relatively familiar with the use and safety indicators through previous lasers, the learning curve for the HoL was seen as more challenging. Operations with the new laser were highlighted to take physically longer at 1.5 hours in comparison
to one hour with the previous TURP procedures. However, the patient and operational benefits of the device gained strong commitment of the clinicians.

In addition to the training process, the regional Medical Physics Department in Glasgow, also referred to as the Laser Protection Group, needed to be involved in order to review the safety implications of installing and using the laser in the hospitals. As the hospitals were already well equipped for the use of lasers, the adoption of the HoL only required minor changes such as the installation of warning signs and lights in operating theatres. The additional work included specific windows and doors in order to block laser rays to make the theatres safe for laser use. It was therefore critical to involve other clinical staff such as nurses and hospital engineers in order to inform about the environment changes and laser safety implications:

*In fact when we bought the laser it is not just about the machine but we also have to do building work because the laser was going to be used in an environment that have to be made later safe so you had to cover the windows unchanged door and put different note that were supplied in a sense not sometimes just the machine but the facilities that go around that. Roughly it came out in the end £250,000, with a device it was around 235,000 in the end with the instruments that went with it.* (Theatre Management_DK)

### 6.3.3 Hospital background

#### 6.3.3.1 Organisation structure

This case study takes place at a new acute hospital in the Central Lowlands of Scotland, overseen by one of the fifteen Scottish Health Boards in the NHS Scotland. The purpose of the new hospital was to replace and combine the services of two former hospitals, which would be converted into smaller community hospitals. (NHS Bedford, 2004). The hospital infrastructure changes were performed in response to a Government Statement early 2002 to reduce the total number of hospital beds in the region (The Scottish Government, 2014). This was particularly driven by a major capacity problem within one of the two original hospitals. In response to the Government Statement, the Health Board submitted a plan for the new acute hospital for public consultation and Minister support, which was officially confirmed in November 2004 (NHS, 2004). The new hospital was scheduled to open in 2009 in line with the adoption of the new laser. As Scotland’s largest construction project, the hospital has a total of 860 beds and has cost over £300,000. The regional
Health Board, under which the hospital is served, is now responsible for the management and the provision of healthcare at four additional community hospitals and 56 health centres covering a population of approximately 300,000 patients. The new hospital organisation structure is illustrated in the following Figure 8 below:

Figure 8: Case 2 – Organisation Structure of the Scottish NHS Organisation

Similar to the regional NHS Trusts in the English case, the regional Health Board in Scotland is governed by a Board of Directors, responsible for overseeing and managing a number of different local hospital and community services. However, the Scottish Health Board in contrast is directly funded by the Scottish Government and accountable to the Cabinet Secretary for Health and Wellbeing, through the Scottish Government Health Directorates. For this reason respondents underline the likelihood of higher level of
influence of the Government and the ability of working collaboratively across local and regional organisations in comparison to the NHS England:

*Scotland is probably the size of one region in England, so we have the ability and luxury of working collaboratively and it’s laid out that we work collaboratively through the Scottish government directive. And again because of the different Scottish government set up the government can control and dictate how things are done in a way that maybe Westminster cannot. He does not have the same ability or degree of influence in England (Theatre Management)*

6.3.3.2 Hospital decision-making process

For the adoption of new medical devices, the health board has a number of key processes in place, including evaluation committees and individuals who are responsible for the funding and evaluation of new medical devices. There are two main approaches in introducing new technologies, which are first of all, the usual Business Case approach and alternatively the use of the Board’s annual Capital Bids. In the latter case, the Health Board introduced an annual Capital Bid approach in order to target potential surplus funding available at the end of each financial year, where applications for new, replacement or novel equipment can be submitted. The business case approach, on the other hand, involves a direct application to the appropriate decision making group. In both instances, the decision making process is determined by the financial limits of the various decision making groups. For example, devices at a capital cost up to £25 000 can be approved at the Surgery Business Unit, while equipment costing above £100000, such as the HoL, requires the final approval to be made by the Director of Finance. The Business case, however, needs to be prepared in accordance with the national guidance of the Scottish Capital Investment manual (SCIM), in order to establish a standard and transparent account of the requested investment (Scottish Government, 2010).

6.3.4 The adoption process: Idea, procurement and use of the Holmium Laser

6.3.4.1 Idea of adoption

Similarly to the adoption at the English Hospital, the interest at the Scottish organisation was primarily clinically driven. The initial idea was initiated by a Consultant Urologist who has been working with the Health Board’s since 1980s, who had experience in using the greenlight laser for the majority of his position. It was not until the laser’s guarantee
contract expired by 1990, when a group of interested clinicians within the health board took the opportunity to research new devices. The group consisted of a number of different consultants within the Urology and the Oral surgery department, who met weekly to discuss potential projects within the hospital. The Scottish case therefore reveals a more team-oriented approach in the adoption of the HoL, where the interest was based on a clinical consensus on the need for new technologies to replace historical equipment, such as electoral surgery:

*The next thing would be in terms of benefit and the overall health of the population - from a public point of view - we would like to show that we are developing and continuing to use new technology and that were not still doing things that we did them 100 years ago.* (Theatre Manager)

During the search for new lasers, the consultant was involved in a number of clinical networks, conferences as well as national and international meetings in order to actively discuss different types of laser technologies for the use in Urology. The holmium laser was promoted by many clinical colleagues as a multi-functional device, offering higher powered and more precise procedures than alternative equipment. The new laser was further recognised as a safer device to human tissue than traditional lasers, such as the Holmium YAG laser. As highlighted by the consultant, the relationships created through the networks have become a cornerstone in driving the interest in the HoL:

*I was hearing about it in through my colleagues in England [...] and there are colleagues in Cambridgeshire were doing similar kind of work [...] and I got to know these people socially and develop some friendship.* (Consultant Urologist _MH)

A number of key individuals across the world were highlighted as important opinion makers and drivers in promoting the new laser within clinical networks and conferences, represented within New Zealand, Canada and England as well as the Holmium Laser Group in Cambridge (HEGS). In the following sections, the various stages of the adoption process will be described, including the procurement and use of the robot at the hospital. The overview of the adoption timeline for the Holmium Laser can be seen in Figure 9 below.
Figure 9: Case 2 – HoL Adoption Timeline at the Scottish NHS Organisation

Idea of Adoption

<table>
<thead>
<tr>
<th>1980-1990s</th>
<th>2005</th>
<th>Mar-06</th>
<th>Aug-06</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultant Urologist using Greenlight laser until contract expiry in 1990s.</td>
<td>Group of interested clinicians networking on new technologies, discovered HoL.</td>
<td>March 2005: Group of Clinicians applied to Health Board's Capital Bid for 20Watt laser</td>
<td>March 2006: Change of focus to 100WATT laser led to postponing the Capital Bid application to the following year</td>
</tr>
<tr>
<td>Assessment by Medical Device Group against the &quot;New Interventional Procedure Policy&quot;</td>
<td>10th August: Board Managerial Meeting on Annual Review - decision to be adopted with the opening of the new hospital in 2009</td>
<td>Board process for agreement on adoption timeline at new hospital</td>
<td></td>
</tr>
</tbody>
</table>

Procurement, Arrival and Use

<table>
<thead>
<tr>
<th>Jan-08</th>
<th>Mar-08</th>
<th>Jun/Jul-08</th>
<th>Apr-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procurement process - Application for a &quot;wave&quot; of EU Tendering procedures</td>
<td>17th March: Order placed for purchase at the end of Financial Year 2008</td>
<td>Arrived and start of use at Hospital</td>
<td>April 2010: Main consultant retired from the hospital</td>
</tr>
</tbody>
</table>
6.3.4.2 Case bid and the Business Case process

In 2005, the group of interested clinicians within the hospital applied to the Health Board through the annual Capital Bid to inquire the availability of funding for the new laser. The bids were assessed by the Board’s Directorate Committee, which includes the involvement of various Clinical Directors, Surgery Directors and the Chair of the Director of Surgery. Due to the significant price difference between the 20 WATT and the 100 WATT laser system, the application was made for the lower powered laser with the intention to use it for Kidney stone removal and apply for the 100 WATT laser the following year. However, the consultant withdrew the request at Board level with the argument that the original idea was to use the higher powered laser for a larger number of different procedures. While the initial application was successful, the clinician requested to resubmit the application the subsequent year for the 100 WATT laser.

So we put in a successful application in that stage for the 20 WATT machine but rather than take delivery I said to the health board “look we really wanted to do it with the other machine, could we just redo our application next year for the 100 Watt machine?” and that’s what we did. We actually produced a lot of the background evidence from the literature and put it together for the successful application in the following year [...] around 2006. (Consultant Urologist)

While the consultant affirms his familiarity with this process following a number of replacement equipment bids submitted in the past, the adoption case for the laser was described as particularly challenging. Due to the forthcoming changes to the Health Board for the construction plans of a new hospital, it was asserted to have been a particular challenge to produce a convincing and competitive application amongst all other bids for justifying the funding for the new equipment. The level of clinical autonomy was therefore significantly reduced and more emphasis put on collective decision making and more horizontal and vertical distributed autonomy. The process was seen as a means to prevent the adoption of unwanted and inefficient equipment by reducing consultant’s autonomy in driving purchases:

A surgeon may say to the Board “I want” and [...] the consultant will be helped to rephrase that into “I need” and “either because of XY and Z” and would be helped to complete the required paperwork to complement the pay case and the company that he wants to buy from is welcomed to tender. (Theatre Management)
6.3.4.3 Decision-making process

Once the application for funding was submitted, the case needed to be assessed by the Medical Device Group, responsible for the overall risk assessment of the procedure. As a minimally invasive technology, the new laser was classified by the Board as an ‘interventional procedure’ new to the hospital and needed to be assessed against the Health Board’s New Interventional Procedure Policy. The policy informed about a number of key principles and steps to be taken into account in the introduction of the laser [NHS (2010)]. The Medical Devices Group was responsible for ensuring the proposal complied with the guidance and took into account key evidence such as NICE and SIGN. Following the approval by the Medical Device Group, the General Manager of the hospital was responsible for approaching the Health Board for final consideration.

In parallel to the adoption process, the Health Board was in the process of organising the restructuring plans of the new hospital in response to the Government Statement to reduce bed stay. The Board was therefore under particular pressure to respond to the bed shortage and associated risks on patient safety.

We were building a new hospital and we had to change the way we were doing things as there has been a Government Statement that stated to reduce the number of beds. So we were in fact reducing two acute hospitals into one with half number of beds which urged us to change the way we treat patients. (Theatre Management)

Ensuing a managerial meeting in August 2006 concerning the restructuring plans, the HoL was considered as a fundamental investment for the hospital to achieve the new targets. The agreement was reached on the basis of the evidence that the laser facilitates more effective bed management and increased turnover through reducing the average bed stay from five days to 24 hours. In contrast to the English Hospital case, the adoption process at the Scottish counterpart resulted into a well-integrated and congruous agreement, balancing the needs and requirements of clinical and managerial perspectives. The level of congruence and integration of different perspectives could potentially shine light on underlying regulative or normative notions leading to more balanced decision making:

The Board had a meeting regarding hospital management wanting moving patients from one hospital to the other and surgeons wanted to get the laser because they felt it was better for the patient as well, but it all came together to a perfect collection [...] of quite a lucky alignment different peoples wishes and needs. (Consultant Urologist_JT)
6.3.4.4 Procurement process

Due to the high cost of the device, the adoption typically requires the undertaking of the formal tendering procedures. However, in the case of the HoL the Medical Physics department confirms only one supplier could be determined for this specific type of laser. The department was therefore able to apply for a “waver” of the European Procurement Law. The purpose of the waver was to justify the legitimate purchase from the specified supplier. Respondents particularly highlighted the risk of being subject to legal challenges on the basis of favouritism from other supplying companies of alternative types of lasers, which however did not fully match the clinical requirements. Following the waver, the order for the Holmium Laser was placed on the 17th of March 2008 and scheduled to arrive at the hospital by early summer 2008. In contrast to the English adoption case discussed above, the adoption process at the Scottish organisation took slightly longer from the idea of adoption in 2005 to the final use in 2008.

6.3.5 Limitations to the ability and willingness to procure and use the Laser

A number of caveats could be determined in the adoption of the Holmium Laser at the Scottish organisation, which affected the ability and willingness of individuals to procure and use the laser. First of all, due to the high number of internal and external interactions between the different stakeholders and various layers of decision making, the speed of decision making was significantly reduced. Furthermore, the price of the device was equally seen as one of the biggest obstacles in the adoption, particularly due to the fierce internal competition between funding bids as well as the additional anticipated restructuring costs for the new hospital. The adoption therefore required strong support and persistence by the project group in promoting the request to be considered at the Health Board.

*The adoption of the case of the holmium laser was not straightforward. We had to go out of our own way to make sure that our application was heard and retained and it was seen as competitive compared to any other applications that were going on. [...] I mean it takes hours and hours and days and days of real work to get this kind of application submitted and approved. (Consultant Urologist_MH)*

However, the challenge of competing investment proposals was quickly reversed and transformed into an opportunity for the hospital, leading to an alignment of operational and clinical needs in reducing bed stay through improving patient recovery.
Finally, the laser safety had to be assessed from a sterilisation and maintenance point of view. The Medical Physics Department instructed the use of single-use fibres instead of the reusable company recommendations, in accordance with a national recommendation by the Directors of Health on laser use. The Health Board had to therefore invest in single-use fibre which significantly augmented the price in comparison to reusable fibre use. Respondents particularly emphasised the frustration with this arrangement, while indicating a certain level of acceptance to the national instructions which could shine light on specific regulative or accountability structures in the Scottish NHS system:

*It is a unique Scottish perspective on sterilisation and I can’t believe that we are so different than the rest of the world, having invested in the procedures to do it in a completely different way. [...] which meant in a Scottish perspective that was they could only use this tube as a single use. Which potentially in terms of the cost of the procedure augmented quite significantly. [...] So it’s just a different surgical perspective and opinion on infection control which I think is quite frankly wrong but I worked with it as I work here.* (Consultant Urologist_JT)

### 6.3.6 Adoption outcomes

The adoption of the Holmium Laser has resulted into a number of important outcomes to the organisation, which can be summarised into three main factors on the level of the end user, the Health Board, and patients. Overall, respondents expressed a general satisfaction with the adoption process and device, delivering up to the expectations of the Health Board and clinical professionals. As elaborated by clinical staff within the new hospital, the laser could be used straight after its arrival and facilitated more efficient management of clinical services while increasing the option for treating patients with enlarged prostate. Interestingly, the consultant initially driving the adoption was not trained for using the new laser. Approaching the start of retirement, the consultant emphasised the opportunity for his colleagues to develop the skills and experience in utilising new procedures. The consultant was instead motivated by improving the hospital Urology services for the benefit of clinical colleagues, which could signify important normative and cognitive qualities in relation to the value system of the organisation and staff commitment levels:

*I was intimately involved with the procurement and the commissioning but never operated myself on this equipment because I realise I was coming to the end of my stay and I wanted my colleagues to develop the skills and to do the*
new stuff [...] So yeah I was actively involved in particular in writing the proposal for this equipment. (Consultant Urologist, MH)

When the driving consultant left the organisation in April 2010, the hospital reported to have performed approximately one hundred HoL cases within a period of one year, which leads to the second main outcome to the Health Board. The adoption of the laser has created significant publicity of the organisation in the media for being the first hospital to be using the new laser device in the NHS Scotland (BBC, 2008). As highlighted by the main consultant:

   Our hospital was the first one of the table in Scotland using the 100 Watt holmium laser and I suppose as I understand my colleagues have been very successful and have got a good reputation for doing these procedures now. (Consultant Urologist_MH)

From a patient point of view, the adoption of the HoL in conjunction with the new hospital has had a number of positive outcomes for the quality of care, with the main one being greater equity and access to healthcare. The merger of the two acute hospitals has led to more equity of care access to healthcare, due to better capacity management at the hospital. Furthermore, the laser treatment allowed for faster treatment with quicker recovery times, allowing for the patient to return home on the same day.

6.4 Robotic Surgery (Case 3): Adoption at an English NHS organisation

6.4.1 Technology and supplier

The Robotic Surgical system is a sophisticated robotic platform for performing minimally invasive surgery in different clinical fields (Satava, 2004). As a computer-assisted information system, operations are performed remotely from the operating table through the use of master-slave manipulators and a three-dimensional high resolution camera (SHTG, 2010). Operations with the robotic platform involve three small incisions into the abdomen of the patient, which reduces the risk of bleeding and post-operative discomfort. Particularly due to the tele-controlled movement of surgical instruments, evidence suggests that the new systems help to overcome some of the main limitations of traditional surgery of potential tremor to patient tissue and organs (Satava, 2004). While the robotic systems can be used in a wide variety of fields, including renal surgery, gynaecology and head and neck surgery, the most common and recognised procedure for robotic surgery
is for Urological prostate cancer surgery (Intuitive Surgical, 2014). Robotic surgery has been viewed as an innovative alternative to the transitional Open and Laparoscopic surgery, manually performed procedures involving the direct penetration of an open wound with the use of large surgical instruments.

The first robotic surgical system, named the da Vinci Surgical System, was launched in 1999 by a US-based Company, Intuitive Surgical (Intuitive Surgical, 2013). With corporate Headquarters in California, Intuitive Surgical supplies the robotic systems internationally across the US, Europe and UK. The idea of the systems originated from the late 1980s at the Stanford Research Institute funded by the US Military in the interest of developing minimally invasive battlefield surgery. Intuitive Surgical was founded in 1995 with the interest in developing the systems for commercial use. With a total of 400 systems in use worldwide, the systems have been the first surgical robot in history to have been approved by the FDA in 2000 (Biomend, 2013).

6.4.2 Level of disruption at the adopting organisation

To establish a more comprehensive picture of the procurement and adoption of robotic systems, the level of change and disruption caused at the organisation has to be understood. The following two impact factors could be observed, which are training and changes to surgical practice and culture.

First of all the adoption of the robot led to significant changes to surgical practice and staff capabilities. Before the arrival of the robot at the hospital, surgeons and nurses had to be trained and informed about safety implications. Despite having a number of fully trained laparoscopic surgeons at the hospital, the robot required a new set of skills for undertaking robotically assisted surgery. The training period in particular required additional time and organisational effort, necessitating additional supervision by the Clinical Governance and Patient Safety Committee. The committee was responsible to not only ensure attendance of medical staff but also certify the demonstration of capabilities of trained staff through practical cases before receiving qualifications. The training was included in the supplier purchasing contract which was seen as a significantly driving factor to the adoption:

"The company was able to fund some training and take people off to Germany, [...] to see and use a robot and get some training. And if that package hadn’t been on offer then this project wouldn’t have been so encouraged to purchase it.” (Innovation Lead)
In contrast to the extensive training procedures for laparoscopic surgery, the training for the robotic systems involved only a number of stages. The supplier arranged extensive off-site training on a robot at a German Hospital for theatre staff. The remaining training included a number of online courses and videos of full-length robotic procedures to inform about safety implications and familiarising the staff with the use of robots. The training could be completed within a minimum of two supervised surgery cases at the adopting hospital (Greenberg, 2013).

Secondly, the use of robotic systems had significant implications on the surgical practice and work patterns of surgeons, leading to longer and more frequent operation cases. While robotic surgery was stated to be a safer and long-term effective alternative to traditional surgery in reducing hospital stay, the length of operations led to a perceived reduction in productivity.

“At the start I think what most people saw is having the inconvenience to create capacity to accommodate longer to do to cases when the robot came in” (SSMTH)

The adoption of the robot therefore challenged the work ethics and culture of affected hospital staff in accommodating longer operation cases in contrast to Laparoscopic cases.

**6.4.3 Hospital background**

**6.4.3.1 Organisation structure**

The adopting organisation in this case was a medium-sized acute hospital in the South West of England, with a resident population of approximately 300,000. The hospital covers an area of 300 square miles and has a bed stay capacity of 450 beds. With a history of adopting innovative procedures and services, the hospital has established a reputation in driving efficiencies through reduced bed. The English Health Ministers have nominated the hospital as one of the five national Centres for Innovation and Training stay (HSJ, 2012).

The Hospital belongs to one of the first NHS Trusts established in England in 1991 and was among the first to have achieved full Foundation Trust status in 2007 (HSJ, 2014). On a national scale, the hospital is regulated by national standards and regular inspections by the regulatory body, Monitor, and is funded through the regional Clinical Commissioning Board’s (CCG) government allocated funds to manage local priorities of a range of hospitals (HSJ, 2014). While CCGs can help to negotiate tariff rates on new practices, capital funds provided by the Charitable Trust
significantly helps to ease the burden for potential investments and increase the likeliness of receiving support from the board and commissioners. On a local level, the hospital is overseen by the Trust Board of Directors responsible for the prioritising of resources against the Trust’s objectives. The Board committees and divisional managers are directly accountable to the Executive Board team and are organised into five work streams led by an executive and non-executive director for the delivery of strategic objectives. In addition, the hospital has a Charity Board of 10 people, responsible for the decision making on raising funding for the organisation. As one of the largest charities in England, the organisation benefits from a large retirement community within the region, facilitating well-funded legacy donations. Figure 10 below presents the organisation chart of the adopting hospital.

**Figure 10: Case 3 – Organisation Structure of the English NHS Organisation**

6.4.3.2 Hospital decision-making process

For the adoption of new medical devices in the use of clinical areas, a number of key stages and groups need to be involved in the decision making process. First of all, all new medical device inquiries are advised to be discussed with the Infection Control Team in order to provide advice on the selection, decontamination and safety implications of the new technology. The purpose was to avoid potential augmented maintenance costs or the purchase of unsuitable equipment (Morey et al., 2012).

6.4.4 The adoption process: Idea, procurement and use of the Da Vinci Robot

6.4.4.1 Idea of adoption

The idea of adoption at the hospital emerged in 2006 through early discussions among consultant colleagues within Urology, Bowel and Ear Nose and Throat (ENT) departments about potential applications of the robot. Despite the interest in robotic surgery at the hospital, consultants regarded the adoption of this technology as an unusual project for the hospital of its size, for which reason the idea was initially deferred for a period of time. From the perspective of the hospital, the robot was perceived as an opportunity to become established as a major cancer centre in the region for Prostate Cancer surgery. The adoption was primarily driven by the clinicians’ fear of falling behind new developments in cancer surgery, driven by the incentive to maintain the hospital in a more prominent position to neighbouring hospitals:

Particularly as a smaller unit like us, who has two bigger units on either side, **there is always the anxiety that the bigger units are seen as a better place to go rather than going to more local hospitals. So you do have to show that you are able to do what everybody else is able to do, or at least as good of services as others can offer though.** (Consultant Urologist_SMDT)

Towards 2008 the group of clinicians observed increasing uptake of robotic surgery in the UK. With a total of eight systems in the country, the consultants emphasised the importance of being part of the developments:

Suddenly they did start to appear around the M25[...] and it was beginning to catch on a better in the UK. **If we were to stay ahead of the curve and we probably**
would need to be established as a major centre before Plymouth would get established because if they were established as a major centre, it’s highly unlikely to get justification for us getting one that would make it put us very much on the back front for many type of surgery.

The consultants attended various meetings and conferences on robotic surgery, which played a major role in influencing and persuading individuals on the potential benefits of the new systems. In the following sections, the various stages of the adoption process will be described, including the procurement and use of the robot at the hospital. The Figure 11 below illustrates the adoption timeline for an overview of the adoption.

6.4.4.2 Decision-making and Business Case Process

The main catalyst in driving the adoption at the Hospital was a Consultant Urologist, who has been in working within the Urology department since 1983. He approached Intuitive Surgical, the supplier of the da Vinci Robot systems to organise a presentation about the systems at the hospital. At the initial contact of the hospital, the supplier expressed particular surprise in being contacted by a medium sized acute Trust for purchasing a robotic surgical system:

When I received a call from this hospital, I said ‘you are calling from where?’. It is not a typical hospital to buy the robot because it is not a cancer centre and would probably not have the volume to use the robot on its own. To use the robot in England NICE recommended adopting the systems in high volume surgery performers. (Intuitive Surgical)

Despite this, the group of clinicians were determined to present the idea to the Clinical Governance group to review the resource and training requirements for the robot and receive agreement in principle by the Medical Director. While the evidence base on robotic surgery was limited at the time of consideration, the agreement at the Committee was merely based on trust and confidence in the clinical proposal of the project, encouraging a “free-to-do it” approach. The Committee expressed confidence in the pursuing a “learning by experience” approach due to the lack of benchmarking capability. However, the main challenge related to the adoption of the systems was the high capital cost of £1.500 000, leading to the concern on how to balance the capital costs with long-term remuneration of NHS funds.
Figure 11: Case 3 – Robot Adoption Timeline at the English NHS Organisation

Idea of Adoption

Drivers:

Observing early adoptions of robotic surgery in the country, created pressure to stay ahead of the curve in surgery

To keep the hospital in a more prominent position with new technologies in response to Patient Choice

Competitive benchmarking

New Consultant Urologist: Started work at the hospital in Urological Cancer Surgery, with interest in continuous improvement

Clinical Interest: The consultant initiated informal discussions with consultant colleagues in other clinical specialties, received with some scepticism

Conference: Consultant participated at a robotic conference in Italy

Supplier contact: consultant contacted supplier for information

1983 2006 Jul-08
Furthermore, the Medical Equipment Committee, responsible for prioritising the funding of new medical equipment, could not support the adoption of the robot due to limited capital funds. The business case was written by the clinical team in order to propose a number of options for counterbalancing this challenge, which are (1) funding the capital costs with the help of the local Charity, the League of Friends; (2) negotiate with the regional Clinical Commissioning Board on more suitable tariff rates in order to accommodate the increased running costs, and (3) propose the option to undertake private work with the robot. Following the agreement of the Senior Management team and Medical Equipment Committee, the clinical group made a presentation to the local Charity. To the benefit of the applicants, the charity has a strong history of collaborating with the hospital on previous capital investments of equipment which could not be prioritised by the Medical Equipment Committee as “must-have” equipment. While the Charity was fully supportive of the project, the full approval by the Health Board was required in order to proceed with the fundraising.

6.4.4.3 Final decision to adopt

At the same time, the Trust Board was approached to accept the concept of moving from traditional laparoscopic surgery to robotic surgery. The decision making at the Board was described as very supportive and clinically orientated, promoting the importance of cutting edge technology as a means to staying “ahead of the curve”. Respondents were particularly motivated in driving the adoption, seeking to avoid the involvement of certain individuals who were not supportive of the robot. The Trust Chairman, in particular, emphasised the preference in adopting the robot in larger District or teaching hospitals as recommended by NICE:

_The question is, would we want to be at the front of innovation in implementation have or at the back? The chairman thought we should be at the back and I myself and my colleagues thought we should be at the front. I think there was a mal-alignment there._ (Finance Director_PC)

With major adoptions of the robot across the UK, the new systems were considered by the majority of the Executive Team as a legitimate investment for the hospital, promoting the need to be at the vanguard of new developments. The importance of new technologies at the hospital was further underlined by the support of an Innovation Lead at the hospital, who played a major role in promoting and facilitating the introduction of the new systems at the Executive Board. The role emerged eight years ago out of the interest in matching technology and practice within the organisation, with the help of an innovation grand
donated by the Department of Health. Overall, the Health Board expressed positive interest in the robotic systems, particularly with the financial support of the League of Friends Charity:

*I think in both cases we were relatively pushing an open door as the trust was reasonably in favour of innovation, trying to progress things, as long as it sounds reasonable, and the legal friends were thankfully in a position where they felt comparable to be able to do that.* (Innovation Lead)

The hospital approached the local Clinical Commissioning Board to negotiate a higher specialist Tariff rate for robotic surgery to compensate for the additional consumable costs in the procedure. The Commissioner played a particularly important role in approving the funding due to the body’s influence on the ability to fund the ongoing use of equipment and control over the agreement on tariff rates:

*The disposable equipment used in the robot is so expensive that the current tariff set up for the work is not sufficient and means that every time you would lose money the money coming in doesn’t cover the cost. [...] So the commissioners are very important here and continue to be because every year we need to go through this process to reassess the Tariff rates.*

The CCG was supportive to a certain extent, setting new standards as a requirement for the new tariff, such as better quality of care and improved patient pathways. While the prostate cancer cases were banned through the NICE recommendations, the tariff rates were calculated for the remaining qualified surgical fields of Colorectal, Gynaecology and ENT for a limited number of 20 robotic cases per year.

**6.4.4.4 Tendering and options appraisal**

It was not until March 2009 when the lead Director of the Board approached the Medical Physics department in order to review the Supplier’s terms and conditions of the purchase of the da Vinci Robot. The procurement team was surprised to be approached with the request to procure the robot without tender specifications. As described by the procurement lead, the executive board was determined in procuring the systems and requested for the contract to be signed within two weeks before the end of the financial year. The standing financial instructions could be waved with the agreement of the Chief Executive and Financial Director, for which reason the process could refrain from the internal standing financial instructions.
The decision was already made, I wasn’t involved to determine and evaluate whether or not to have this device and put procurement process in place. I was simply asked to review the terms and conditions of the contract that were proposed to us by Intuitive. My decision was limited to all these good sound terms and conditions that I had to sign up to and my feedback was no they are not.(Procurement Lead)

Despite the high cost of the system, the charitable contribution on the capital costs further exempted the procurement process from pursuing the European Tendering process. As a consequence, the lack of competitive tendering left the hospital with disadvantaged bargaining power vis-à-vis the supplier, and reduced capability in negotiating more favourable terms and conditions. Despite engaging in hostile negotiations with the supplier, the Medical Physics department had limited success in changing the contract conditions. The contract was arranged for a period of five years, from the 29th of June 2009 to the 28th of June 2014, with the hope to be able to renegotiate the terms and conditions in the future. Following the agreement of the terms and conditions, the order for the robot was placed on 26th of March 2009 and confirmed at the hospital on the 17th of June 2009. Overall the adoption process for the robot took approximately two years from the initial idea to the final purchase and has been in use since the 5th of October 2009 (PCA, 2012).

6.4.5 Limitations to the ability and willingness to procure and use the Robotic systems

During the adoption process for the da Vinci Robot systems, two main caveats could be identified from the case. First of all, the NICE Improving outcomes cancer guidelines published in 2003 in England, acted as a barrier to the hospital for using the robot in urology cancer procedures. To be qualified as a cancer centre, hospitals were required to demonstrate a minimum throughput of 150 pelvic surgeries per year, which could not be met by the adopting organisation (NICE, 2002; PCA, 2012):

We hampered by the fact that we weren’t supposed to be doing prostate surgery and couldn’t do them open either. The procedures were seen to be done in the larger units. (Consultant Urologist_SMDT)

The Trust was nevertheless able to procure the robot against NICE’s and the supplier’s recommendations, however restricted in the use of the robot for specific Urology procedures such as prostate cancer. As a result, the hospital sought to engage in
collaborative activities with the neighbouring cancer hospital, in order to be able to fully use the robot for Urology cancer patients. With the help of the Innovation Lead, the main Consultant Urologist started negotiations with the neighbouring cancer hospital on the collaborative use of robotic surgery. The idea was to adopt the robot and collaboratively work with the neighbouring hospital to send their prostate cancer patients to be operated on the robot at the adopting organisation. However, the cancer centre was not supporting of the proposal, fearing the collaboration would impact procuring the robot in the future. The driving Consultant Urologist ended up withdrawing from the project completely in order to avoid further conflict:

*The discussions didn’t go very well and our neighbouring hospital didn’t want to collaborate on the use of the robot. In the end the surgeon who was originally the most keen urologist, said “this is going to cause so much problems between me and the department in the neighbouring hospital that I don’t want to do it”. So we couldn’t use the robot in Urology as was originally intended but fortunately for us the other specialties were have been keen to use it.* (Innovation Lead)

Secondly, due to the high bargaining power of the supplier Intuitive Surgical and late involvement of the procurement department, the robot was procured on the basis of unfavourable terms and conditions for the hospital. This led to significant conflict and political complications between the company recommendations and nationally binding health and safety regulations on decontamination of equipment. While the company recommended the use of a specified decontamination product for the equipment, the contract did not comply with the governmental Medicines and Healthcare products Regulatory Agency (HMRA) regulations, responsible for setting the safety, quality and performance standard in the UK. The HMRA regulations recommended the use of a decontamination process which provides safety reports at the end of the process, indicating the temperature, time and duration.

*Given the problem we got now politically, if we are continuing to clean the scopes in a way that satisfies the current regulations and decontamination of the HMRA, we are in clear breach of Intuitive’s recommendations. So we may end up in a case over this [...] It’s tricky because you have to balance that doing the right thing because we don’t want poison and infect patients [...]. We don’t want to be in that position with your only supplier of that equipment.* (Procurement Lead)
With the expiry of the purchasing contract at the end of June 2014, the procurement department hoped to renegotiate more favourable conditions and change the decontamination recommendations to be in compliance with the HMRA standards.

**6.4.6 Adoption outcomes**

The adoption of the robotic systems has led to a number of key outcomes which can be summarised into three main factors in the light of the wider Hospital Trust, clinicians and patients. First of all, from perspective of the Hospital, the adoption of the da Vinci Robot has played a major role in enhancing the organisation’s competitive profile in the delivery of cancer surgery in the region. While the hospital was not able to establish itself as a major cancer centre for Urology, the robotic systems helped to attain a more reputable position through successfully performing day case procedures in a number of surgical areas, such as throat and mouth cancer surgery for kidney removal, known as nephroureterectomy. The press played an increasing role in driving the success of the hospital in the use of the robot in new surgical areas not yet performed on the systems. Despite the strong interest and successful image of robotic surgery at the hospital, clinicians were particularly disappointed in the failure to reach the full potential with the systems. The fact that the robot could not be used for the hospital’s most prominent cancer cases (Urological prostatectomies), the hospital was unable to meet the anticipated performance targets negotiated with the Clinical Commissioning Board on tariff remuneration. As a consequence the hospital does not receive the required financial support for the robot in the case of break-downs.

*Due to our financial position, the Trust may have to stop using the Robot if we have a major repair bill for it. This is such a shame as patients benefit from this device however, the tariff does not support this.* (Procurement Lead)

From the perspective of the patient, the robotic systems were particularly well received, demanding the hospital for the availability robotic surgery, which was primarily driven through the notion of patient choice:

*A lot of their patients were coming to ask for keyhole surgery so [...] asking to have a hysterectomy or other surgery done in that way. [...] In a way patient choice is driving some of it as well*” (Innovation Lead)

The da Vinci Robot therefore played a major role in enhancing the organisation’s competitive profile in the delivery of cancer surgery, helping to attract patients as well as staff to the hospital.
6.5 Robotic Surgery (Case 4): Adoption at a Scottish NHS organisation

6.5.1 Level of disruption at the adopting organisation

To understand the procurement and adoption challenge, one has to understand the level of change and disruption the technology caused and anticipated to the hospital setting. In contrast to the English case discussed above, the robotic system adoption at the Scottish organisation yielded wider regional and national benefits, which can be summarised into two main points.

First of all, while the adoption of robotic surgery was uncertain to many Health Boards in Scotland, the hospital committed to implement infrastructural changes through building new theatres to increase overall theatre space and potentially accommodating the robot as part of responding to the local capacity problem. While this was not a compulsory investment, the theatres were refurbished to a higher standard to improve theatre infrastructure and introduce more modern facilities.

At the stage we are at the moment is that we will be building new theatres at the moment. And as part of making them ready for the robot, we had to refurbish the theatres to a higher standard so we actually committed to that improved refurbishment that's the first stage. [...] That's up to what we have committed to but what we haven't committed to at the moment is the robot itself. (Deputy Director of Finance_AS)

The additional theatre work was funded partially through government support as part of the Patient Rights Act (2011) as well as through charitably funds as the first commitment to purchasing the robot. With the anticipated arrival of the robot, the theatres were due to be operational by December 2013.

Secondly, besides from being one of the first hospitals to pursue the adoption of robotic surgery, the systems were equally seen as a ‘new’ investment to the NHS Scotland. The prospect of adoption therefore led to significant cross-regional and national level disruption to the supply of cancer services across Scotland. Due to the high capital cost and potential high volume need of the new systems, the Scottish Government sought to influence the adoption to ensure compliance with the Patient Rights Act 2011, on the full use of the systems and improving equity of services across the country. As a comparatively small country to England, with a population of just over 5000,000, the aim was to systematically introduce the robot in Scotland through specified Robotic Centres in order to attain more equitable and consistent services across all Health Boards. The national prospect in
establishing cancer centres across Scotland was additionally influenced by NICE’s recommendation in achieving a minimum of 150 cases per year with one robot. The government support in investing in the systems was therefore based on the LHB’s ability in meeting the required throughput within the allocated region. The Hospital under study was particularly concerned in driving the adoption to be considered and selected as one of the regional robotic centre in Scotland:

*People within our Health Board and within the hospital are conscious of this sort of centre, having to stay current and relevant for maintaining operations.*

(Medical Director_SSMTH)

The adoption of the robot therefore evoked significant cross-regional interest in Scotland, with a number of different health boards involved in contesting for the regional cancer centre status.

6.5.2 Hospital background

6.5.2.1 Organisation structure

The case for the anticipated adoption of the da Vinci Robot in Scotland was investigated at a large teaching hospital situated in the north-west of Scotland. As a leading centre in medical cancer research, the hospital has strong links with the University (NHS, 2014). As the largest hospital within its regional Health Board, it has to be noted that the Scottish hospital serves a population twice as large as in the English adoption case, reaching a total of 600,000 patients (NHS, 2014). The Health Board was established in April 2004 and is held into account through a number of regulations and standards set at national level by the Scottish Government and sub-organisations, such as the Scottish Health Improvement Scotland (HIS). The latter is responsible for scrutinising health services provided by Health Boards on public quality assurance and safety. As one of the 14 health boards within Scotland, the hospital is responsible for implementing Scotland’s National Health Agenda through its local hospitals. Despite the relatively hierarchical order of the organisation, communication links and decision making tend to incorporate a collaborative approach, particularly in relation to large and more complex questions with wider regional and national implications.

The hospital under study was one of the first hospitals in Scotland to have pursued the adoption of the new surgical robotic systems. The health board was described as relatively receptive towards innovative ideas, with particular clinical interest and support in driving innovation in the hospitals. With the help of the local charity, UCAN, a funding campaign was initiated called “Transform Today’s Surgery with Tomorrow’s Technology”
The Hospitals organisational structure and accountability links to external regulatory and governing bodies is illustrated in Figure 12 below.

**Figure 12: Case 4 – Organisation Structure of the Scottish NHS Organisation**

6.5.2.2 Hospital Decision Making Structure

For the adoption of medical devices, there are a number of key processes and bodies in place responsible for the evaluation and management of local, regional and national adoption projects. The health board is governed by a board of directors and supported by...
a number of sub committees, with particular emphasis on collective decision making for the introduction of new medical equipment. While the final decision is typically taken by the Chairman or Chief executive on behalf of the Board, the authority of individuals in making decisions varies according to the capital cost of the device under consideration. For instance, for capital investments between £500,000 and £1000, 000 decisions have to be signed off by the Director of Finance or the Chief Operating Officer. For investments between £150,000 and £250,000 decisions can be taken by the Divisional General managers or delegated Budget holders. Finally for investments below £150, 000 can be taken by the Divisional General Managers reciprocally or the Director of Facilities (NHS …, 2005). Typically, decisions for new capital investments are taken locally at the Health Board. However in the Case of the da Vinci Robot, the capital cost of £2000,000 exceeded the Board’s financial limit, leading to the involvement of regional and national bodies in the assessment of the adoption. The regional Planning Group and Scottish Government needed to be involved in order to assess the cross-regional and national implications of introducing the new systems. While the surgical systems received initial funding through selected charities, the interest of the Scottish Government was to ensure a degree of influence over the adoption developments across the country, driving boards to act in the “Scotland-wide interest”:

The boards might have been under more pressure to get one because of local interest and pressure from other health boards saying "you need to hold the line here because of evidence and we have to act in the corporate/Scotland wide interest". [...] So that pressure on them is psychological for them in a way because there is not a formal governance accountability thing - there will be no mechanism to bring that board in any kind of book for doing that but they might suffer the consequences of relationships [...]. But in terms of the 34 adoptions in England, those individual institutions that have adopted, well they have not had considerations like that, it’s either "we get one or we don’t" for they own narrow reasons. (Scottish Government_MO)

The prospect of adopting the da VinciRobot at the LHB has consequently evoked wider national interest, leading to significant cross-regional implications in the management of waiting times and patient equity. The following section will present an overview of the adoption progress and the various stages the hospital had to go through in order to facilitate the adoption of the new systems.
6.5.3 The adoption process: Idea, procurement and use of the Da Vinci Robot

6.5.3.1 Idea of Adoption

The hospital was introduced to the da Vinci Robot through the main Consultant Urologist who learned about the new systems through research papers and the annual America Urology Conference (BAUS) 5 years ago. The Consultant was specifically driven by the interest in new innovative advances in the Urology area for continuously improving the clinical services. With no previous experience in using the robot to support the case, the consultant hoped for the capital cost to eventually reduce in order to strengthen the economic argument and cost-effectiveness of the new systems. The idea of adoption can therefore be said to be equally clinically driven as observed within the English adoption case above. At the time of considering the new systems, the hospital was under pressure to respond to a new Patient Rights Act published by the Scottish Government in 2011 implementing new waiting time standards in response to local capacity issues Scottish Government, 2011). The hospital experienced particular capacity shortage in the area of prostate cancer keyhole surgery, with only one qualified prostate cancer surgeon. The da Vinci Robot was believed to help targeting the large waiting lists and allow for more patient throughput (NHS [ ], 2013). Initially the consultant had to convince colleagues in other clinical specialties to receive support for the interest and collectively present the case to the local management team. The consultant emphasised the importance of the collective support in order to receive further consideration at the Health Board:

“If not all our colleagues are supportive then you are going to struggle because you must have a voice somewhere [...] you want everybody to be on board before presenting it to the local the management as they would have to face the cost” (Consultant Urologist_SMCĐT)

With the support of colleagues from other clinical specialties, a number of key clinical leads and theatre staff formed a project group for driving the adoption of the robotic systems. The project group initiated early discussions on the estimated implications on theatre space and training for the robot and started writing an initial draft of the business proposal. Due to the high capital cost of the systems, the group engaged in informal discussions with the local Charity Board to receive support in principle for raising money for the robot. However, at a capital cost above 1000,000, the full adoption process had to be undertaken with final consent by the Health Board to raise charity money for the robot. The idea of adoption however was pursued at a much later incident in 2009, in contrast to the year
2006 as observed in the English case. In what follows, the various stages of the adoption process will be described, including the procurement and use of the robot at the hospital. The Figure 13 below illustrates an overview of the adoption process and timeline.

### 6.5.3.2 Hospital decision-making process

In contrast to the English adoption case, early discussions started to emerge between the clinical team and directly with the hospital management team in order to receive informal support on the idea. Approval had to be granted by the Hospital’s surgical team to accommodate the running costs within the local budget, followed by the approval by the local Management Team to receive managerial support on the case. The management role was to ensure the credibility and viability of the project, reviewing the evidence base on the benefits and broader context to the adoption:

> My part as the local management was trying to say this isn’t just about those guys wanting another toy to play with. There are some real benefits. Because every surgeon, [...] pretty much every gizmo that came out that some sales rep spoke to them about, they would want to buy and they would try and convince it was the right thing to do clinically but broadly was bullshit, 99% of the time. [...] So the robot was slightly a toy, but I was very convinced by the laparoscopic work and I fundamentally believe that this is the right approach for humanity [...], and for me the robot probably is just the next step” (Divisional General Manager_AC)
Figure 13: Case 4 – Robot Adoption timeline at the Scottish NHS Organisation

<table>
<thead>
<tr>
<th>Idea of Adoption</th>
<th>Impact Factors:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure in reducing waiting lists for prostate cancer surgery</td>
<td>Lack of staff capacity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Local Decision Making</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital Surgical team: agreement granted to accommodate running costs within the local budget and verifying the credibility of the project</td>
</tr>
<tr>
<td>Local management: Reviewed initial proposal and supported the idea in increasing productivity and offering multidisciplinary potential</td>
</tr>
</tbody>
</table>

Idea: Consultant Urologist team about robotic systems through conferences and research papers.

Project Group: Early discussions initiated with key clinical leads to form a project group to discuss implications on theatre space and training.

2009 2010
**Regional Decision Making**

(Jan 2010) Regional Decision Making: North of Scotland Planning Group approached by Health Board to collaborate on cancer services

Chief executive & health board: Consultant presented the idea to the board to receive agreement on maintenance and running costs

Medical Equipment Committee: Informed about new interventional procedure

**National Decision-Making & Intervention**

Impact Factors:

<table>
<thead>
<tr>
<th>Pressure from Media</th>
<th>Equity of care</th>
<th>Transparency in adoption</th>
</tr>
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</table>

National Planning Forum Report: Advised Health Boards not to purchase the Robotic Systems - regular meetings held until April 2014

Scottish Government: Involved in Large scale project of robot as affects wider scale and equity

Funding Boost by Scottish Government: £1bn funding provided by government to introduce robotic systems at the hospital at the start of 2015

---

2011

May 2012 - April 2014

Aug-14
The local management team reviewed the initial proposal and supported the idea based on the argument of increased theatre throughput and multidisciplinary work. Following the approval, the driving Consultant presented the case to the Executive Board with the help of the managerial team in order to convince the corporate level of the wider picture of the robot acquisition and on covering maintenance and running costs. However, the Health Board expressed a slight concern about the lack of evidence base on clinical and financial performance as well as the potential difficult learning curve associated with training and practice. The Board had to be persuaded on the potential of the systems, emphasising the challenge in achieving efficiency savings in relation to the high capital costs:

*I think we have to do a lot of convincing people at corporate level and I did a couple of sessions with them for the executive team. The approach was trying to explain that the wider picture on becoming a much bigger game with wider impact. So that was a quite a different approach because most urgent cases are just about efficiency and waiting times.* (Divisional General Manager_AC)

In response to the high capital cost of the robot the Health Board consented to the Charity Board’s proposition in launching a funding campaign. However, in order to achieve cost-effective operations in the long term, the hospital would require a high volume of cases to balance out the ongoing maintenance and capital costs, which required cross regional collaboration on the use of the robot. For this reason, the North of Scotland Regional Planning Group and Scottish Government had to be involved to discuss the wider regional and national implications.

### 6.5.3.3 Regional decision-making process

While discussions within the English adoption case were primarily focused on the use of the robot at the local health organisation, the Scottish case revealed particular local responsibility to consider the wider cross-regional and national implications and potential use of the robotic systems. For this reason, the Regional Planning Group was approached about the Health Board’s prospects in becoming established as the regional centre for robotic surgery to collaborate on robotic cancer services with neighbouring hospitals. On the basis of maximising the potential cost-effectiveness of the robotic systems, the central argument behind collaborating on robotic cancer cases was to reduce duplication and unequal distribution of robotic systems across the country. Negotiations with the Scottish Government particularly emphasised this outlook in planning a national roll-out initiative for implementing a number of robotic centres across the Scottish NHS. Other hospitals
therefore had to be informed about the prospect of adopting the robotic surgery at the hospital under study and consent for the hospital becoming the regional centre for robotic prostatectomies:

There is a North of Scotland Planning Group where all other hospitals in the region had to buy into the fact that we would be the centre to have the robot instead of them. So there's always a little bit of competition. And once you get that approval then you just have to get your money. (Consultant Urologist_SMDTT)

The competition is induced by the central argument in creating robotic centres across Scotland, while emphasising the importance of a collaborative approach to reach a consensus on the adoption of the systems.

6.5.3.4 National decision-making process

At the same time, the Scottish Government became involved in the discussions in order to make recommendations to the Cabinet of Secretary of Health on the implementation of robotic surgery in Scotland. For this, the Executives approached the National Planning Forum (NPF), a group founded to deal with large-scale and complex issues which cannot be resolved at local or regional level. A specific sub-committee was established within the NPF to focus on reviewing the evidence for the robot and discuss implementation plans. The latter group consisted of representatives from the Scottish Government and leads from each Health Board to discuss larger projects with wider cross regional impact. The Scottish Executives particularly emphasised the importance of ensuring collective decision making with input of other important stakeholders such as senior clinicians, health experts and external innovation groups to contribute to the discussion:

It is a courteous nature as well because we are small with 14 boards there is a sense of collectivity and NHS Scotland family that we talk about, but it doesn’t mean that we are all best friends as it sounds. But there is some big things as well that they are thinking about the greater good as well. It is a quite collaborative approach and there is a statutory requirement to collaborate on certain issues, I can’t remember the name of the act but its 2002, social care act or something. (Scottish Executives)

In the process of reviewing the literature for robotic surgery, the Scottish Government came to the revelation that not all Health Boards in the country have fully moved from open surgery to laparoscopic surgery. While robotic surgery is perceived as the future of cancer surgery by consultants, the Scottish Government was more alarmed about the need to ensure equitable services and consistency in the health care delivery across Scotland.
With a total of 400 prostatectomy cases per year across all Health Boards, the major concern was to ensure adequate number of robot installations to effectively manage capacity issues and warrant cost-effective surgery. The National Planning Forum (NPF) was requested to undertake a more thorough assessment of the evidence and publish a comparing of open, laparoscopic and robot-assisted surgery, in response to which all Health Boards were mandated to refrain from the purchase of the da Vinci Robot until the report was made available. The work was published in September 2010 by the Quality Improvement Scotland (QIS) following the enquiry from the NPF (QIS, 2010). The hospital under study therefore had to halt the adoption process in the anticipation to receive approval to proceed by the Scottish Government:

The Scottish government is very interested in the initiative, however there are no robot in Scotland at the moment, there are quite a few in England and on the continent. So the Scottish government are preparing an evaluation of the efficacy of the robot to allow us to be the centre for Scotland for robotic surgery. So we cannot go ahead until we got the green light by the Scottish government to do that. Once we have that we would move to the development business case and purchase the robot. (Finance Director_AS)

Similarly, the media and other Health Boards played a significant role in exercising pressure on the Scottish NHS for adopting the robotic systems. However, opposed to exercising competitive pressure on LHBs, the Scottish Executives were merely concerned about the perceived image the media portrayed of a “poor backward Scotland” due to the lack of robotic surgery in the country. Clinical consultants on the other hand indirectly influenced the Government through complaining about the disregarded opportunities in renouncing to robotic surgery.

6.5.3.5 Final decision to adopt

Following the review published by the NPF, the Scottish government took approximately two years to review further evidence and become convinced by the potential of robotic surgery for the Scottish NHS. During this period the NPF held a total of four meetings to review the evidence and make recommendations to the Scottish Executives. The meetings took place in February 2911, May 2012, and December 2012. The last NPF meeting was held in April 2014, resulting into the conclusion to implement the robot in Scotland at a number of key selected centres, followed by the final decision by the Scottish Government Policy Officer and Secretary State of Health. The Health Board under study was finally granted the permission to proceed with the adoption, following the official confirmation on the 19th of August 2014 by the Scottish Government. As a means to facilitate the process,
the Government invested £1000 000 to complement the fund raising efforts by the local Charity for the robot. Waiting for the funding to be released to the Health Board under study to proceed with the adoption, the robot is anticipated to be purchased and installed by the beginning of 2015. The adoption process is therefore currently ongoing and has taken approximately five years since the initial idea of adoption, in contrast to the English case demonstrating an adoption process between two to three years.

Overall, the decision making for the da Vinci Robot was a long and complex process involving a number of different stakeholders within the LHB, and external decision making bodies such as the Regional Planning Group and Scottish Government.

6.5.4 Limitations to the ability and willingness to procure and use the robotic systems

The adoption efforts at the Scottish NHS organisation revealed a number of challenges to the introduction of robotic surgery in Scotland, leading to significant delays in decision making at various levels. The following four challenges could be discerned.

First of all, the case reveals strong accountability lines between Government and Healthcare providers in Scotland, emphasising the collaborative and integrated nature of the decision making on the robotic systems. While this has helped to ensure more transparent and well informed decision making at local, regional and national level, the involvement of different stakeholders significantly halting the decision making process for approximately three years. The Health Board sought to reduce the influence on the local decision making through seeking external funding from the local Charity Board:

_The government are complete control freaks, which has partly to do with scale. They tend to want to have a role in every decision. And again practically, having the money raised by the charity changes that dynamic a lot. If the health board was procuring it with tax payers money the government would have much more influence on it but because it’s been raised by members of the public it changes that dynamic dramatically, which was again part of our tactic. It was something that we were very conscious of and the value of that and the benefit of it._

However, the Government eventually supported the adoption with additional funding complementing the budget for the robot, considerably increasing the Government’s involvement in the decision making.
Secondly, as could be similarly observed within English adoption case, the robot evoked considerable levels of scepticism in the Scottish case. However, in contrast to the case in England where the main levels of resistance were perceived at user end, the Scottish case revealed resistance levels exclusively at national level. While the drive for adoption was especially encouraged at the LHBs, the Scottish Government expressed major concern about the lack of evidence base available. Respondents compared the resistance levels to former large-scale surgical procedure changes, such as moving from open to laparoscopic surgery. While the resistance towards the robot may have been perceived as a normal learning curve, the Scottish Government, was apprehensive to potential risks to the patient and financial. On the other hand, the LHB was described as keen to drive the adoption, with particular emphasis on collective decision making and judgement:

*It’s trying to have a look at the holistic picture and find balances which are worthwhile or not. [...] Perhaps the robot might be of poor judgement, perhaps it might turn out to be something that we shouldn’t have gone with but every now and again you kind of get collectively behind something to say get this is worth something to have a go for all of these reasons that I’ve mentioned above, [...] it’s not hard and scientific calculation, a bit of optional appraisal and casual mind. [...] I think it was that there was probably more of the feeling and judgement than the hard science behind it. (Medical Director_SSMTH)*

Due to the value of driving equity of care across Scotland and the potential impact the robotic systems may have beyond local services, there was a strong sense of risk aversion perceived at national level.

The third challenge was related to the overall cost of the robot as a result of the monopolistic position of the supplier. The high cost was described as the major impeding factor, reducing the Health Boards ability in procuring the systems locally, which again significantly increased the decision-making power of the central government.

*However in terms of the value of a technology like the robot our limit is half a million pounds before it has to go through our full decision making process. In the case of the robot it is definitely beyond that, it is a big project and goes through our full decision making process and assessed by the Scottish executives. (Deputy Director of Finance_AS)*
The lack of evidence base further reduced the bargaining power of the LHB in convincing the Scottish Government on the cost-effectiveness and benefits of the robot. The cost of the robot was therefore a major impeding factor, leading to the delay of the adoption process with the involvement of the various decision making levels.

### 6.5.5 Adoption outcomes

While the robotic systems were not yet procured at the time of investigation, the case reveals a number of significant consequences for the Health Board and Hospital. From the regional level and Health Board perspective, respondents recognised the benefit of adopting a more systematic approach for introducing robotic surgery in Scotland. The values of equity and cost-effectiveness were major drivers to supporting this view, highlighting the importance of achieving full use of the systems:

_In terms of England having many robot but not being used, that’s an impression rather than the fact that I think there is very few high-volume centres so I imagine that means that they are less cost-effective in using the robotics and not using them in some places._ (Consultant Urologist_ENBRG_AMCNLL)

The systematic approach adopted in the NHS Scotland case has therefore facilitated more transparent and collective decision making, ensuring more effective use of the limited NHS funds. On an operational level, the robot was anticipated to play an important role in retaining current operations as well as attract new undergraduate students and facilitate staff and student recruitment:

_A good example is, there was a review whether we should continue doing neurosurgery in our hospital and as a teaching hospital it’s important to have also offered things here that will still attract undergraduate students and make it a good innovative place to be [...] But every time you take away something from here you are actually diminishing the services here to be more like a district general hospital rather than University teaching Hospital. So that was one of the key issues, so again once you start not doing cancer services and cancer surgery I think there’s a real downturn on our attraction._ (Medical Director_SSMTH)

The fundraising activities of the Health Board for the da Vinci Robot therefore allowed to strengthen the position in becoming the centre of robotic surgery and consequently improving the hospital's reputation as a research and teaching centre. The aim was to
become a leader in the field of low-level invasive surgery opposed to open or laparoscopic work. However, from the perspective of the end user, the consultants expressed frustration and developed disbelief in the Scottish Government support and supply of the agreed funding boost for the robot. The Clinical team highlighted the strong level of influence the Government was able to exercise on the local adoption agenda, expressing particular frustration of the hospital’s dependency on central decision making and conclusion:

**The length of adoption depends how long the government drag their feet for.** To be honest that could be as long as a piece of string. **They got all the documentation in front of them and had them for a while now.** Even when they have gone through the National Planning Forum, **god knows how long that will take.** After that they then have to decide how they would implement it nationally. (Consultant Urologist_JR)

### 6.6 Fibroscan: Liver Stiffness Diagnostic (Case 5): Adoption at a Scottish NHS organisation

#### 6.6.1 Technology and supplier

Over the recent years, liver disease has become a major concern across Europe as a growing burden to many healthcare systems due to a rise in liver associated deaths (Blackier et al, 2013). The main causes of deaths are a result of liver cancer and liver fibrosis (Guha et al. 2006). Fibrosis is the scarring of the liver from hepatitis B and C as well as excessive alcohol consumption and non-alcoholic fatty liver disease (Ibidl. 2006). Hepatitis C in particular has become a major concern, with an estimated 216,000 chronically infected persons in the UK, which breaks down to 160,000 infected people in England and 50,000 in Scotland (The Scottish Government, 2008). The rising figures indicate the need for better management and staging of liver disease, due to the high cost burden on healthcare systems, particularly in the NHS. For example, the cost of liver disease in the NHS Scotland has been reported to be £3.6 billion per year, equalling £900 per adult (Herald Scotland, 2013). More stringent measurements for prevention and management of chronic liver disease was therefore essential to tackle the growing challenges. The Fibroscan is one example of new non-invasive methods that has gained increasing interest over the recent years for more accurate prediction and informed decision-making on the staging of liver fibrosis (Candranel and Nousbaum, 2012). As an alternative to liver biopsies in the majority of liver disease cases, the Fibroscan is said to provide improved prediction measures of the likelihood of Hepatitis C and HIV related
deaths (Marcias et al, 2013). Developed by a French company, Echosens™, the Fibroscan is a non-invasive diagnostic device for measuring the progression of the liver fibrosis, caused by continuous and long-term liver damage (Rosenberg and Parkes, 2008). Prior to the Fibroscan, the only available method for diagnosing liver disease was the use of biopsy to directly sample and examine the liver. This involves an invasive operation where a small sample of the right lobe of the liver is removed for examination, which is associated with high patient discomfort, pain, and increased risk of post-operative complications. In contrast, the Fibroscan uses vibration-controlled transient elastography (VCTE™) to measure the degree of scarring in the liver. Depending on the patient’s BMI, two types of probes can be used for a BMI below or above 30. The probes are then placed on the skin at the level of the liver and a total of ten low frequency vibrations are sent to the liver of which the mean is taken. The vibrations are transmitted in the form of pulses externally to the right lobe of the liver, measuring the degree of stiffness of the liver, determined by a mean value of the pulse velocity (Mueller and Sandrin, 2010). The Fibroscan only reacts with organs which contain elastic properties called the “Young’s Modulus”, and can be found in the liver, spleen and kidneys. Due to the distance between the organs, the Fibroscan measurement does not interact with the other organs containing the Young’s Modulus (Ibid, 2010). The device was originally developed through a PhD project by two French Physics graduates who argued to be able to assess the quality of kidney stones through measuring the stiffness. The idea then was developed further to be applied for the measurement of other human organs such as the human liver, which proved to be highly clinically relevant.

6.6.2 Level of disruption at the adopting organisation

To understand the procurement and adoption challenge, one has to understand the level of change and disruption the technology caused, which can be summarised into three main points.

First of all, as a relatively new device, with no previous user experience reported by hospital nurses and consultants, potential users had to undergo extensive training organised by the company. The training involved a total of 10 weeks of training, which was included in the company contract.

Secondly, as a relatively new device with a slight “disruptive” element in the provision and delivery of healthcare, the adoption of the Fibroscan induced a significant shift in work force dynamics, roles and responsibilities. Traditionally Biopsies could only be performed by specialist consultants, which led to an accumulation of capacity and longer waiting times. In this case, the Fibroscan has helped to significantly increase staff availability.
through delegating the responsibility to qualified nursing staff in not only performing the diagnosis but also communicating initial results to patients. Nurses reported to feel more empowered and benefit from greater clinical decision making autonomy through the use of the new device.

Finally, on a more regional scale, the Health Board had to envisage how the Fibroscan would fit into the wider picture and affect the delivery of healthcare beyond the local services in order to achieve equity of care. This was treated as an important undertaking for preparing the procurement and use of the Fibroscan, which involved approaching the regional MCN to be involved and become a key decision maker in the adoption process:

So we didn’t have the fibroscan but it meant that some boards would continue to deliver their services even without a fibroscan and that goes against the national ethos in terms of having equity of care. [...] It came to the stage where it got down to the equity of care where patients in Glasgow could get a Fibroscan but patients in Ayrshire couldn’t. (Infectious Disease Consultant)

### 6.6.3 Hospital background

#### 6.6.3.1 Organisation structure

The case study of the Fibroscan adoption at a Scottish NHS organisation was done at a District General Hospital and University Hospital in the South West of Scotland. The hospital is one of four central hospitals under the regional NHS board, providing health care to a population of approximately 400,000 people with a total of 645 beds. Offering a wide range of acute services across a number of specialties, the main focus of this narrative will be on the Sexual Health, Blood Borne Virus (BBV) department, as the key department requesting the purchase of the Fibroscan (NHS, 2013). With a total annual budget of £700 million distributed across all four hospitals, the Health Board has a procurement spent of over £105 million during the year of the Fibroscan acquisition in 2011/2012 (The Scottish Government, 2014). While the local budgets are allocated by the Scottish Government, Health Boards are accountable to specific national and locally agreed targets against which the budget is to be utilised for. Nationally set ‘best practice’ guidelines and Quality Performance Indicators (QPIs) are published by the public body Health Improvement Scotland holding health boards into account through the Scottish Government budget and locally agreed targets (SIGN, 2013). The Scottish NHS system has slightly different organisation structures than in England, where the delivery of care in Scotland is delivered through Managed Clinical Networks (MCNs), advocating a highly
collaborative approach to improving health care and decision making in organisations. The MCN is a multidisciplinary network of people who work in different disciplines such as infectious diseases of Blood Borne Viruses. The Figure 14 below illustrates the current organisation structure of the organisation.

**Figure 14: Case 5 – Organisation Structure of the Scottish NHS Organisation**

6.6.3.2 Hospital Decision Making Structure

For the adoption of new medical devices the local clinical team presents a proposal to the MCN where the proposal is collaboratively assessed and an outcome agreed. The Fibroscan adoption therefore took place within a highly integrated system of regular supervision and national guidance in local and regional performance of health boards. The health boards in Scotland have very distinct organisational structure, where hospitals and caregivers provide healthcare through the virtual national and local “Managed Clinical Networks” (MCNs). As described in ‘section 6.6.3.1 Organisation structure’, the health board is governed by the virtual national and local MCN, which represent a variety of specialties and interests, allowing groups of health professionals, organisations and patients, to work together across the boundaries of the various Health Boards (National Service Division,
Therefore local decisions on projects with potential impact beyond local healthcare services, need to be considered by the MCN before local planning can proceed. The Ayrshire and Arran health board is a key member of the West of Scotland Sexual Health MCN, which aims to support the continuous development and improvement of sexual health services across five health boards (Sandyford, 2014).

In the case of the local organisation structure, the NHS Board is run by the Executive and Senior management teams and supported by several committees and management groups consisting of multidisciplinary teams. The adoption of new medical devices typically has to be assessed by the hospital’s financial and governance processes, including the sub-committees of the Health Board. The decision making here is vastly dependent on the capital spent of the medical equipment under consideration, where for examples expenditures above £3000 require to be purchased according to the Health Board’s financial instructions, executed by the Medical Devices and Capital Planning Groups. Capital investments which exceed £100 000, on the other hand, require to be authorised by the Executive and Directorate teams. As a technology with potential cross-regional implications and a total cost of £100 000 for the static Fibroscan, the full decision making process had to be undertaken.

6.6.4 The adoption process – Idea, procurement to the use of the Fibroscan:

6.6.4.1 Idea of adoption

The first encounter with the Fibroscan was reported by the local hospital’s Medical Physics lead in 2008 at an exhibition on Infectious Diseases and liver health. While the department lead expressed interest in the technology and retained the information leaflets from the company, the medical physics department was not aware of any potential application for the new systems at the time of consideration. It was not until 2010 with the employment of a new Infectious Disease Consultant who had been exposed to the technology at previous posts and communicated the interest in staging liver disease to the Medical Physics Department. As the only Infectious Disease Consultant at the hospital, the consultant held full responsibility of services within the Departments and has been appointed as the lead of the Managed Care Network (MCN) Blood Borne Virus (BBV) department for Hepatitis B, C and HIV. The consultant therefore engaged in discussions with other clinical leads within the MCN and Health Boards that had used technologies to stage liver disease. His interest was further supported by the high patient and user
satisfaction reported by larger health boards such as Glasgow and Edinburgh, which helped significantly to increase credibility:

> We have a new infection disease consultant started maybe just over two years ago. And he was quite enthusiastic about staging liver disease so he came to see me and [...] And we had thought, one of the new techniques that can be used for it are elastography [...] It’s a fairly new technique it’s not something that is particularly well established but as you mentioned that, I have seen something that is specifically intended for this. (Medical Physics Lead)

In what follows, the section will describe the various stages of the overall adoption process, including the procurement and use of the Fibroscan. The Figure 15 below illustrates the full timeline of the adoption process.

### 6.6.4.2 Tendering process

As the first point of contact and first responsible for introducing new medical devices, the Medical Physics department at the local hospital was involved to help identify and confirm a suitable technology for the consultant’s request. In response to the request, the Medical Physics lead recalled the information on the Fibroscan and approached the supplier to arrange a demonstration of the Fibroscan with the BBV department. The purpose of the demonstration was to verify the need for the technology and prioritise amongst other alternatives within the annual procurement budget of £100 000. For this reason, the Medical Physics department is typically involved early in the discussions to support and facilitate more informed decision making on the value for money against alternative options.

> We also take advice on any piece of equipment were buying from the medical physics Department, who was the person we link very closely with. I mean he was excellent and very supportive and make sure that we went through the right processes [...] so that was certainly helpful to us to get the guidance and advice. (Infectious Disease Consultant)
Figure 15: Case 5 – Fibroscan Adoption Timeline at the Scottish Health Organisation

**Technology Development & Idea of Adoption**

<table>
<thead>
<tr>
<th>Drivers:</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Patient Satisfaction reported in larger hospitals</td>
</tr>
<tr>
<td>Hepatitis C Action Plan requesting improvement in Liver care</td>
</tr>
<tr>
<td>Promoting shared and equal practice across Scotland</td>
</tr>
</tbody>
</table>

**Idea:** Infectious Disease Consultant heard about the development of the Fibroscan through his previous locum work in the South West of England.

Communicating with other clinical leads and MCN network on experience of best practice

Initiating adoption: Consultant approached Medical Physics to discuss the idea and alternative technologies

2003-2006 2009 Mid 2009
**Decision-making and Procurement Process**

**Funding Process:** MCN lead applied to Scottish Government to request access to the Hepatitis C Action Plan 2-year fund for capital investments - approved on the basis of meeting wider needs and targeting the under provided area of liver disease.

**2-3 months internal finance process:** on revenue-to-capital budget transfer

**Tendering Process at Medical Physics:** With two qualified bidders, the Fibroscan was the least expensive and first choice in the scoring system

**Business Case Process:** Formalising Business Case with financial calculations on maintenance and calibration

**Contract Agreement with Supplier EchoSENS:** Long negotiations process due to high number of people involved in decision making (2 months approval)

**Final Approval by the Executive Board:** Application submitted to the board for information

**Procurement and Arrival of Fibroscan at Hospital**

**Training:** 10 week training period with qualified nurses

**Two new portable Fibroscan devices procured for the use in Prison and General Community**

**Adoption and Use**

**Challenge:** Consultant realised delivery of inequitable services in the region, with the inability to reach community and prison as patients did not attend the hospital due to deprivation and drug abuse

---

**Jul-08**

**Nov 2009 - Aug 2010**

**Jun 2011 - August 2011**

**Feb-12**

**Apr - Nov 2012**
Once the agreement was made to pursue the adoption of the Fibroscan, the Medical Physics lead prepared the tendering specification for the need. While the benefits and evidence base collected through the external networks and experiences from other hospitals and Health Boards for the Fibroscan has led to a clear consensus among the MCN and Clinical team to adopt the Fibroscan, the Medical Physics team had to undertake the procurement process due to the high cost of the device. The tender specifications were published in November 2009, resulting into a total of two responses emerging out of the application. To the benefit of the clinical team, the preferred medical device happened to be cheaper than the other bidder’s device, which significantly helped the decision making. Once the tender results have been reviewed and agreed in August 2010, the funding for the Fibroscan had to be organised.

6.6.4.3 Regional and National decision making

At the same time, the driving consultant addressed the lead coordinator of the BBV Managed Care Network to assess the Fibroscan against the regional Quality Performance Targets (QPI) to enhance the Business Case for the adoption and apply for funding support. At this stage the clinician started to draft the initial business case in collaboration with the MCN lead coordinator to allow for a balanced argument. The multidisciplinary nature of the MCN serves as a means to receive extensive feedback and suggestions on prioritising available investment plans. Discussions were primarily influenced by the Government published Hepatitis C Action Plan and the Health Improvement Scotland Clinical Guidelines, which promoted the use of the Fibroscan as a means to improving the management and diagnosis of liver disease in the UK. It was a particular national lever to address the need for achieving equity of care and combat the low uptake of liver healthcare due to deprivation, poverty and drug abuse in the region. For this reason, the Government provided funding to all Health Boards over two years between 2008 and 2011 through the Hepatitis C Action Plan embedded within the BBV revenue budget. The purpose was to support and facilitate improved management of the Hepatitis C epidemic and improve the delivery of healthcare in this clinical area. The funding was perceived as a significant boost to the adoption profile for the Fibroscan facilitating the decision making at the MCN. However, embedded within the BBV revenue budget, an application had to be submitted to the Scottish Government to allow utilising the funding for capital investments. The government had to be convinced on the wider impact of the new device on the delivery of healthcare, targeting an underprovided area which the Fibroscan can be applied to. The application could therefore be strengthened through demonstrating the ability to meet
certain Quality Performance Indicators with the Fibroscan, such as improving the patient journey and reducing patient waiting times in relation to the Hepatitis C healthcare provision. The clinicians and MCN lead demonstrated strong support of meeting the national and regional targets which significantly helped to receive approval by the Government:

*The local delivery is additionally monitored through local delivery plans through annually meets and agreed at the start of the financial year [...] and our particular target for the Fibroscan was to reduce the waiting time target.*

*(Infectious Disease Consultant)*

6.6.4.4 Funding Agreement

Following agreement from the Government, the transfer of the revenue budget for capital use had to be undertaken with the help of the hospital Capital Planning Group, referred to as capital charging. As a capital investment above £5000, an estimated recurring investment had to be calculated to manage the ongoing maintenance and operation expenditures for the use of the new device. The budget transfer was therefore necessary in order to allow for accurate financial planning for the new purchase and required producing a final draft of the Business Case for the Fibroscan, completed in August 2011. The process was described as relatively slow and could only be concluded within 2-3 months of the application until the end of November 2012.

6.6.4.5 Final decision making, procurement and training

Following the financial agreement, the consultant approached the Health Board to provide the final approval to the adoption request. As a well-documented decision making process, the Health Board was able to provide direct agreement to the request, with final approval granted by January 2012. The Board gave instructions to the Medical Physics department to procure the Fibroscan, which arrived at the hospital by February 2012.

6.6.5 Limitations to the ability and willingness to procure and use the Fibroscan

Two main challenges could be observed in the adoption of the Fibroscan at the Scottish health organisation under study. First of all, the slow speed of adoption was perceived as a particular challenge to the hospital, leading to six to nine month decision-making process
from the initial writing of the business case at the MCN up to the final adoption. The patient need for faster health care delivery posed particular pressure on the Health Board to accelerate the adoption to target the long waiting lists for Hepatitis C patients:

> It was just very frustrating for us to get to that point, we were planning to use it earlier but it didn’t work. We just had to carry on with the current processes which took much longer. [...] But by not having it we could not improve what we already had in place. (Public Health Specialist)

The delay was predominantly attributed to the highly interdisciplinary nature of the various decision making groups, represented at national, regional and local level, leading to reduced individual autonomy in decision-making autonomy and consequently slowing the decision making process due to the high involvement of different perspectives. While the involvement of different stakeholders significantly contributes to more informed and congruent decision making, there was a large amount of interactions through email and questions on training and insurance which needed to be addressed:

> The groups comprise of a variety of people or specialties. It’s a good idea and it’s good if you are adopting something very new as it allows people to look at it, but unfortunately everyone looks at it purely from their own perspectives. [...] There is always a driving committee member who would make sure that his voice is the loudest. (Medical Physics)

Secondly, despite the improvements observed in the overall patient care and health care delivery at the local hospital, the static nature of the Fibroscan failed to meet the wider healthcare needs of certain groups of patients. Prison services in particular have experienced inequitable services in terms of receiving access to the Fibroscan:

> By getting a Fibroscan we realised that we created a kind of problem, because [...] the prisons should get exactly the same level of treatment as if they were in the community (Medical Physics Lead)

The importance of equity of care in Scotland and link to the local and regional performance targets have led the health board to pursue the adoption of two further Fibroscan devices, in order to be able to provide services in prison and community.
6.6.6 Adoption Outcomes

The adoption of the Fibroscan has led to the following outcomes to the Health Board, the hospital, patient and user. From point of view of the Health Board, the Fibroscan has helped to significantly contribute and target the national standards of equity of care and patient access. With the highly risky and invasive nature of traditional biopsies, it was in the Scottish Government interest to address the urgency of controlling the growing epidemic within the Hepatitis C Action Plan initiative launched in 2008 in Scotland. The Action Plan is launched on the background of the severity of the issue for controlling the growing epidemic. While Hepatitis C infections may not cause any symptoms for 20 to 30 years, the virus can silently start to develop symptoms of cirrhosis. With the help of the Fibroscan the diagnosis and progression of liver disease was determined in a safer and faster way while proving a more enjoyable patient journey. The Fibroscan was perceived as central to facilitating earlier diagnosis for a higher number of patients and has therefore been endorsed as an essential piece of equipment for all health boards in Scotland to address the problem of equity.

On a more local scale, the Fibroscan has facilitated to reduce overall waiting times from traditional biopsy waiting times of 42 weeks to only 15 weeks. This has significantly improved the efficiency in managing and delivering healthcare to the patient through faster and more accessible liver diagnosis. Waiting times were also one of the regional quality performance indicators, to which the technology was a significant contributor in meeting these targets. Furthermore, the Fibroscan has facilitated a reduction in the use of liver biopsies, which due to the non-invasive nature of the technology, has led to a reduction in biopsy associated bed stay. The hospital was able to indirectly harness additional cost savings and achieve more efficient allocation of resources through releasing hospital bed spaces, which can be used for other important areas.

From the clinicians and nurses point of view, as users of the Fibroscan, the new device has helped to speed up the clinical decision making process allowing for earlier diagnosis of liver disease and more targeted triage of patients. In contrast to traditional biopsy work, the new device has facilitated the hospital to perform day clinics through performing same day diagnosis and discharge of patients, minimising follow-up appointments. As a non-invasive diagnostic tool, the Fibroscan did not require the use of anaesthetics, eliminating the common risks associated with traditional biopsy work as well as speeding up the overall process. Furthermore, the delegation of diagnosis work and certain clinical decisions to nurses has significantly helped to relieve the clinician’s work load. The use of the Fibroscan
has therefore helped to increase staff capacity through distributing the work load onto a larger pool of staff.

From the patients’ perspective, the Fibroscan has offered a non-invasive alternative to biopsy procedures, which has significantly improved the patient journey through less discomfort, faster diagnosis without the need for hospital bed stay. However, due to the high scale of deprivation in the area, a high number of patients were not able to access the necessary diagnosis and treatment required. For this reason the Health Board embarked on the purchase of two further portable Fibroscan machines in November 2013. The purpose was to help reach the portion of the patient population that do not have access to the Fibroscan clinics, such as Prisons.

6.7 Fibroscan: Liver Stiffness Diagnostic (Case 6): Adoption at an English NHS organisation

6.7.1 The Level of Disruption at the Adopting Organisation

To understand the procurement and adoption challenge, one has to understand the level of change and disruption the technology caused. In the case of the English hospital case, the major disruptions could be observed in two main instances as follows.

The training for the Fibroscan required to be undertaken according to the recommendations set in the supplier contract, involving a total of four days of supervision by a company representative including a two day training course organised at the hospital. The training was primarily targeted at potential users of the device, such as Hepatology nurses as well as clinical consultants in order to perform the procedure and appropriately learn how to interpret the results. However, despite the ease of training for the device, the hospital was under pressure to create time and theatre space during and outside working times to accommodate the Fibroscan training around daily clinics and clinical engagement. At the completion of the two day training course, hospital staff was given the opportunity to practice among each other to become acquainted with the new device. The practice training involved approximately 10-15 supervised patient cases to complete the training. Overall, the training was perceived as a relatively simple process, with ongoing support provided by the supplier to facilitate the adaptation period.

Secondly, as a completely new type of diagnostic device leading to a fundamental change of practice in the treatment and management of liver disease, hospital staff, nurses in particular, had to be made acquainted with the new responsibilities and functionality of
the Fibroscan. As a means to support hospital staff during the familiarisation period, the lead nurse at the Hepatology Liver Unit took the initiative to compose a detailed training protocol of user instructions for the Fibroscan. The protocol has been distributed to concerned staff and a further copy enclosed to the Fibroscan device, for direct reference for potential users.

6.7.2 Hospital Background

6.7.2.1 Organisation structure

The adoption of the Fibroscan in the English NHS system took place in a major teaching and research hospital located in the North West of England. With over 50 wards and more than 850 beds, it is the largest hospital in the region and is considered as one of the UK’s leading liver cancer centres (The Hospital, 2014). The Scottish case in contrast presented a relatively smaller health organisation, yet research intensive University Hospital.

According to a Public Health England report on liver disease and inequality of care in the North West of England, the region has one of the highest liver profiles in the country. The report indicates that the region shows with the highest levels of deaths due to liver disease in the North West (BBC, 2007). The high liver profile has been particularly marked by the strong problem of deprivation and smoking in the region, which presents a significant risk factor for developing liver cancer. The hospital shows strong commitment to provide targeted support to patients through the “Love Your Liver” Campaign and improved management of liver disease and has been one of the first hospitals in the North West to have adopted a Fibroscan machine in 2009 (British Liver Trust, 2012).

6.7.2.2 Hospital decision-making structure

At the time of adoption the hospital has been in the process of applying for a Foundation Trust Status to meet the stringent national target in achieving the status before April 2014 (Monitor, 2014; Hazell, 2014). However, the application has been delayed and eventually deferred at the last assessment in November 2012, to allow the recent changes Board governance structures incorporated into Trust in 2010, to be fully integrated into routine practices. The changes include the establishment of Board Committees for more effective and systematic decision making within the Trust, particularly related to the introduction of new practices, medicines, structural changes and medical devices. In particular the new
Techniques and Medical Devices Group (T&MDg) has been nationally recognised and praised by the regulatory body NICE for providing an effective and streamlined application and assessment process for new techniques and medical devices and assurance of required governance arrangements (NIHR, 2008). The organisation structure is illustrated in Figure 16 below.

**Figure 16: Case 6 – Organisation Structure of the English NHS Organisation**

6.7.3 The Adoption process – Idea, procurement to the use of the Fibroscan

6.7.3.1 Idea of adoption

Similarly to the Scottish NHS case, the awareness of the Fibroscan at the hospital can be traced back to early discussions among clinical networks and has been on the liver horizons since the introduction of the Fibroscan in 2003 in France and reciprocally 2007 in the UK. However the lack of available evidence base on the new systems at the time led the hospital to be more critically responsive to the initial contact from the Supplier. Over time more adoptions could be observed across the UK, which significantly increased the interest
in the new device across clinical networks. The idea of adoption at the hospital under study was eventually pursued by a Consultant Hepatologist and Gastroenterologist in 2008, revealing an equally clinically driven objective as observed within the Scottish case. With a strong interest in liver disease, the Consultant was principally motivated by the high burden of liver disease in the UK as reported in a report on liver disease in England by the NHS National end of Life Care Intelligence Network (PHE, 2012). With the high liver profile of the hospital at the time and high mortality rates in the North West, the Fibroscan was believed to be of strong potential in addressing the problem. Despite the early figures of uptake observed, the Fibroscan was not universally adopted across England, with the hospital under study being one of the first in the North West to have adopted the new diagnostic device.

The following section will describe the various stages of the overall adoption process, including the procurement and use of the Fibroscan, with an illustration of the adoption timeline in Figure 17.

**6.7.3.2 The Business Case process**

However, in contrast to the Scottish adoption case, the consultant did not pursue the standard adoption process and independently initiated discussions with key individuals within the directorate and finance departments. Due to the non-invasive nature of the device the request for adoption received considerably little resistance within the hospital, perceiving the technology as a relatively low-cost and win-win investment:

> [The Fibroscan] was one of those devices that were **easier to look like a win-win because obviously save money in it safe patient discomfort etc and easy thing to use** and from the medical side of things are familiar with it anyway so it was a **relatively straightforward** one and because it was a huge number of people would be using it, outcomes were pretty quick and simple as well (Medical Engineering_BB)

The adoption was particularly driven by the need to improve the patient journey and risks associated with undertaking liver biopsies. For this reason the Business Case was not particularly challenged and seen as redundant on the basis of delivering a clear clinical need which could be addressed with the help of the Fibroscan. The adoption therefore was not properly reviewed by the Medical Physics team and other important decision making groups, in contrast to the Scottish case.
### Figure 17: Case 6 – Fibroscan Adoption Timeline at the English Health Organisation

<table>
<thead>
<tr>
<th>Technology Development &amp; Idea of Adoption</th>
<th>Decision-making and Procurement Process</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Drivers:</strong></td>
<td><strong>Development:</strong> Echosens launches Fibroscan in France - On the &quot;Liver Horizons&quot; for 6 years before considered at hospital</td>
</tr>
<tr>
<td>Clinical Interest in Liver Disease</td>
<td>UK Market: Launch of Fibroscan in the UK Healthcare Market</td>
</tr>
<tr>
<td>NHS National End of Life Care Intelligence Network report on the burden of liver disease in the NW</td>
<td>Idea: Clinical driver to adoption, initiated by a Consultant Hepatologist</td>
</tr>
<tr>
<td>Increase in Fibroscan Adoptions in UK</td>
<td>Key and final Decision-making: Directorate approval of a 3-4 month hiring period</td>
</tr>
<tr>
<td></td>
<td>Training: Four day supervision and two day training course for hepatology nursing staff and consultants</td>
</tr>
<tr>
<td></td>
<td>Procurement: Fibroscan was Procured</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2003</th>
<th>2007</th>
<th>Mid 2008</th>
<th>Oct-08</th>
<th>Nov-08</th>
<th>Jan-09</th>
</tr>
</thead>
</table>

- Development: Echosens launches Fibroscan in France - On the “Liver Horizons” for 6 years before considered at hospital.
- Idea: Clinical driver to adoption, initiated by a Consultant Hepatologist.
- Key and final Decision-making: Directorate approval of a 3-4 month hiring period.
- Training: Four day supervision and two day training course for hepatology nursing staff and consultants.
- Procurement: Fibroscan was Procured.
Adoption outcomes & Challenges

<table>
<thead>
<tr>
<th>Fibroscan could not meet anticipated volume of patients in region</th>
<th>Staff Shortage</th>
<th>Problems with Tariff and miscalculation of maintenance costs</th>
</tr>
</thead>
</table>

**Adoption and Use**

- **Adoption of 2 Portable Devices:** Newly appointed Consultant Hepatologist pursued the adoption of two further portable Fibroscans in response to equity and capacity problem.
- **Capital Planning:** Revisited Business case and handed in to Finance Department & Capital Planning Group.
- **Tariff Negotiations:** Consultant negotiated with the regional CCG Chair on adapting Tariff Rates.
- **Adoption:** Two new portable Fibroscan devices procured.

Timeline:
- Jan-10
- Feb-10
6.7.3.3 Final decision making and unrecorded hiring period of the Fibroscan

With the help of the Directorate manager, the costs and capital bids were initially estimated and agreed. As the only commercially available technology of this kind and lack of evidence base, the hospital decided to initially hire the Fibroscan to test the device prior to adoption. However, following the ongoing process in the appointment of a new Finance Director in 2009, there was a lack of transparency in the decision making, leading to unrecorded hiring and finally procurement of the Fibroscan. While the Fibroscan was procured in January 2009, the hiring period is believed to have taken place over a period of three to four months prior to the adoption. The department expressed particular dissatisfaction about the lack of involvement of key decision makers within the hospital:

*Before we came in to post we had hired a Fibroscan. It’s not clear how that was. There was a business case done around it but if we are very honest about it, finally it was procured through a carried conversation with a senior person in the organisation and they just got it.* (Director of Finance_MS)

While the Scottish case above demonstrated direct commitment of the hospital to procure and use the Fibroscan, the English hospital sought to first probe the idea through initiating an initial hiring period. Opposed to the Scottish case where regional implications were of particular concern to the adopting organisation, all decisions and motives for adoption at the English hospital were primarily local and driven through clinical interest. Following the agreement of the Senior Management, the adoption was supported by the Directorate manager who approached the Medical Physics and Finance Departments to proceed with the adoption of the device. The adoption was perceived as a straight-forward process with little resistance from key individuals involved:

*The adoption was not an issue, we weren’t challenged and I think a lot of that is because it is a non-invasive technique, obviously the more invasive procedure is then the more rigorous the assessment process* [Consultant Hepatologist_PR]

While the adoption was primarily clinically driven, the consultant was mainly involved in convincing the senior management team on the adoption, with limited involvement in the financial and operational perspectives of the adoption:

*Obviously we have a service agreement for maintenance and that has been done behind-the-scenes so I don’t have much of an interest in that* [Consultant Hepatologist_PR]
6.7.4 Limitations to the ability and willingness to procure and use the Fibroscan

The hospital was described to have two main internal adoption routes for new technologies, encompassing either a direct application to the Capital Planning Group or undertaking the Business Case process through the Medical Device Committee. However, in the case of the static Fibroscan, the hospital’s decision making processes were not considered and procured through direct approval by the responsible Directorate. This has led to two closely interlinked problems in the final use of the Fibroscan at the hospital. First of all, due to the lack of process following, the maintenance and servicing costs were not adequately considered, consequently leading to unexpected additional costs and problems with the tariff remuneration:

The adoption went through no process as they already got the kit when they started but then we had costs that incurred after that because they weren’t appropriately considered the maintenance and servicing. (Director of Finance_MS)

End users, such as nurses on the Fibroscan clinics, expressed particular concern about the number of procedures being undertaken since the adoption of the device, which at the time were not properly remunerated with tariff:

The weight affected us as we were thinking we were doing that many here [...] keeping a database and paper copies of the results. We were actually saving biopsies and saving hospital bed after biopsies and I was a little worried and all of us were worrying that there is no funding getting on it (Lead Nurse_TA)

The second problem arose during the first year of using the Fibroscan at the hospital. Hospital staff recognised a problem in relation to meeting the actual volume of patients in need of a Fibroscan in the region, attributed to a shortage of staff and lack of treatment take up by certain groups of patients such as prisons and patients of drug abuse. In response to the issue at stake, a newly appointed Hepatologist Consultant who joined the organisation in 2009 pursued the adoption of two further portable Fibroscan machines in order to reach a wider patient population in the community and prison services. It was not until the adoption of two further portable Fibroscan machines in 2010 that the original business case was revisited and led through the appropriate decision making process. With the help of the new request, the consultant was able to renegotiate the tariff remuneration directly with the Chair of the regional Clinical Commissioning Group (CCG) in response to
the concerns expressed by nursing staff on the tariff. While a similar scenario could be observed within the Scottish case, the adoption of two further portable machines was primarily driven by the need for achieving equity of care, opposed to meeting local capacity issues. With the help of the portable Fibroscan devices, the hospital was able to reach a wider patient population, allowing targeting patients who would typically not be able or willing to attend the hospital.

Overall the adoption was furthermore a relatively fast process in contrast to the Scottish case, which took approximately four years due to various negotiations at local and regional level. The English case on the other hand achieved adoption within only one year, which could be explained by the lack of process following by the initial applicant.

6.7.5 Adoption outcomes

The adoption of the Fibroscan has had a significant impact on the overall delivery of healthcare at the hospital in the management and diagnosis of liver disease, which can be summarised into three key operational, user and patient factors. From the operational point of view, the use of the Fibroscan has helped to reduce the number of liver biopsies at the hospital by over 60%, through increasing the number of 'first-appointment symptoms' for faster diagnosis and treatment of affected patients. As a non-invasive diagnostic tool, the Fibroscan did not require the use of anaesthetics, eliminating the common risks associated with traditional biopsy work as well as speeding up the overall process. In turn the Fibroscan has facilitated to reduce the number of bed stays associated with liver biopsy procedures, which produced particular operational and financial benefits to the hospital. Consultants in particular expressed satisfaction with the increase of speed in liver diagnosis, allowing for a significant increase in first appointment symptoms and reduced follow up appointments. Nurses were impressed by the speed of the service, allowing performing specifically targeted Fibroscan clinics only five to ten minute appointments for 12-15 patients per clinic. Nursing staff further benefited from an increase in autonomy in clinical decision making, producing and communicating results to the patients according to the company recommendation. Communicating Liver biopsy results in contrast were exclusively the responsibility of consultants. Finally, the adoption of the Fibroscan further induced considerable improvement in the patient experience through reduced pain and length of treatment. Due to the high discomfort associated with liver biopsies, patients had a tendency to avoid examinations leading to and counterproductive management of the Hepatitis C epidemic. For these reasons, the device received high acceptability among hospital staff and patients, becoming the number one choice of treatment for the patient.
6.8 Review of the cases: A summary of key outcomes

In conclusion of the six case narratives presented above, this section offers a summary of the individual key case outcomes and serves as a means for comparison of the cases in the subsequent analysis chapter. The key comparative factors represented are the organisation type and size; the adoption demand/drivers; the adoption initiator; the perception of the technology; time of idea and time of adoption; stakeholder involvement/interactions and adoption outcomes/impacts on the organisation, and are summarised in Table 4 below. The factors serve to qualify the ability and willingness of the individual organisations to adopt and use new technologies and will be analysed alongside the impact of different institutional set-ups of the regulative, normative and cognitive dimensions of the conceptual framework. A more detailed representation of the analysis and the various elements can be found in Figure 18 in ‘section 7.1 Introduction’ below.
Table 4: Summary of key features and outcomes across the six procurement cases

<table>
<thead>
<tr>
<th>Adopting Organisation</th>
<th>Organisation size (population covered)</th>
<th>Level of Disruption</th>
<th>Initiating factors</th>
<th>Demand/Driver</th>
<th>First Perception of Technology</th>
<th>Time of Idea</th>
<th>External Stakeholders &amp; Interactions</th>
<th>Internal Stakeholders &amp; Interaction</th>
<th>Time of Adoption</th>
<th>Outcomes/Impact</th>
<th>Breadth of Use</th>
<th>Challenges/Limitations</th>
<th>Source: Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>District hospital</td>
<td>Large; 850 beds; 300,000 patient population</td>
<td>Streamline service provision process to combat service inequality between the two hospitals (larser seen as disruptive element in allowing the change in practice)</td>
<td>Training: two day course Cambridge and in-house training one to one mentoring cases</td>
<td>Clinical demand for advanced laser system</td>
<td>Positively viewed as a clinical &amp; management perspective</td>
<td>September 2010</td>
<td>Supplier External opinion drivers (HSC Specialty Groups &amp; New Zealand; Managed Clinical Network);可以说是other hospitals; supplier external opinion drivers</td>
<td>End user (Clinicians, Nurses)</td>
<td>January 20013</td>
<td>8 months hiring period to delay adoption</td>
<td>Consultant limited to use device 3 days out of 5 per week; laser withheld from other department to avoid interest</td>
<td>Unnecessary lack of interest on managerial level; perceived safety concerns of end users</td>
<td></td>
</tr>
<tr>
<td>Acute hospital</td>
<td>Acute hospital</td>
<td>Small Medium sized; 450 beds; 600,000 patient population</td>
<td>Training: extinction of clinical staff in Germany and involvement of the Clinical Governance and Patient Safety committees (training included in company contract)</td>
<td>Clinical demand for advanced laser system</td>
<td>Positively perceived across hospital perspectives</td>
<td>March 2005</td>
<td>Neighbouring hospital; Department of Health/NHCE</td>
<td>End user (Clinicians, Nurses)</td>
<td>May’ 2008</td>
<td>Faster patient recovery and reduced patient bed stay</td>
<td>Driving by government statement to reduce hospital bed stay</td>
<td>No lack of interest on managerial level; perceived safety concerns of end users</td>
<td></td>
</tr>
<tr>
<td>Teaching hospital</td>
<td>Large; 645 beds; 440,000 patient population</td>
<td>Implications of surgical practice and work patterns (longer and more frequent operations leading to a perceived reduction in productivity)</td>
<td>Education to change resistance due to initial inexperience to create capacity</td>
<td>Continuous clinical drive for improvement of clinical services</td>
<td>Positively perceived and considered at local hospital level</td>
<td>2006-2008</td>
<td>Regional Managed Clinical Network; Government</td>
<td>End user (Clinicians, Nurses)</td>
<td>October 2009</td>
<td>More efficient management of clinical interventions and capacity</td>
<td>Driving by patient demand</td>
<td>No lack of interest on managerial level; perceived safety concerns of end users</td>
<td></td>
</tr>
<tr>
<td>District general hospital</td>
<td>Large; 850 beds; 300,000 patient population</td>
<td>Education to change perceptions of staff, initial resistance to safety concerns of blindness and injury risk</td>
<td>Problem of large waiting lists</td>
<td>Driven by high burden of liver disease in the region &amp; mortality rates.</td>
<td>Positive perception and considered at national level</td>
<td>2009</td>
<td>Regional Managed Clinical Network; Government</td>
<td>End user (Clinicians, Nurses)</td>
<td>January 2013</td>
<td>Fracture of local level in response to long waiting times</td>
<td>Consultant limited to use device 3 days out of 5 per week; laser withheld from other department to avoid interest</td>
<td>Lack of evidence base; cost of systems; high volume requirements of systems</td>
<td></td>
</tr>
<tr>
<td>Teaching &amp; research hospital</td>
<td>Large; 850 beds; 300,000 patient population</td>
<td>Streamline service provision process to combat service inequality between the two hospitals (larser seen as disruptive element in allowing the change in practice)</td>
<td>Training: two day course Cambridge and in-house training one to one mentoring cases</td>
<td>Continuous clinical drive for improvement of clinical services</td>
<td>Positive perception and considered at national level</td>
<td>2010 (Opinion)</td>
<td>Regional Managed Clinical Network; Government</td>
<td>End user (Clinicians, Nurses)</td>
<td>July 2008</td>
<td>Fracture of local level in response to long waiting times</td>
<td>Consultant limited to use device 3 days out of 5 per week; laser withheld from other department to avoid interest</td>
<td>Clinical benefit was not achieved</td>
<td></td>
</tr>
</tbody>
</table>

**Adopting Phase Factors**

- **Table 4:** Summary of key features and outcomes across the six procurement cases

**Initiating factors**
- Clinical demand for advanced laser system (1990)
- Hospital’s previous laser contract expiration
- Clinical demand for advanced laser system
- Continuous clinical drive for improvement of clinical services
- Problem of large waiting lists
- Driven by high burden of liver disease in the region & mortality rates.

**Demand/Driver**
- Consultant’s exposure to the laser and use at previous hospital positions

**First Perception of Technology**
- Strongly recommended by clinical team
- Positively received as a clinical & managerial perspective
- Positively received across hospital perspectives
- Positive perception and considered at local hospital level
- Positive perception and considered at national level

**Time of Idea**
- September 2010
- March 2005
- 2006-2008
- 2009
- 2010 (Opinion)

**External Stakeholders & Interactions**
- Supplier (External opinion drivers: HSC Specialty Groups & New Zealand; Managed Clinical Network; clinicians from other hospitals; supplier external opinion drivers)
- Neighbouring hospital; Department of Health/NHCE
- Regional Managed Clinical Network; Government
- Regional Managed Clinical Network; Government
- Regional Managed Clinical Network; Government

**Internal Stakeholders & Interaction**
- End user (Clinicians, Nurses)
- End user (Clinicians, Nurses)
- End user (Clinicians, Nurses)
- End user (Clinicians, Nurses)
- End user (Clinicians, Nurses)

**Time of Adoption**
- January 2013
- May/June 2008
- October 2009
- January 2015
- January 2009

**Outcomes/Impact**
- 8 months hiring period to delay adoption
- Faster patient recovery and reduced patient bed stay
- More efficient management of clinical interventions and capacity
- Increased patient choice & equity of care; faster recovery & recovery performance of 100 cases in the first year of adoption
- Hospital attained a reputable position in a number of surgical areas for performing day case robotic surgery
- Fracture of local level in response to long waiting times for robotic surgery
- Disbelief in government support
- Most national standards on increased equity of care and patient access
- Reduction of waiting times to 30 weeks
- Reduced biopsy; indirect cost savings and more efficient resource allocation through reduced bioburden; increased staff capacity through delegation of tasks
- Reduction of biopsies by 60%; increase of first appointment symptoms through faster diagnosis; reduced number of bioburden and increased speed of service of 15 minute clinics.

**Breadth of Use**
- Consultant limited to use device 3 days out of 5 per week; laser withheld from other department to avoid interest
- Immediate use; consultant consulted
- Use in various clinical fields; legally restricted in the use in prostate cancer surgery
- No use as yet; anticipated use limited to prostate cancer work
- Used fully every day through targeted Fibreloc clinics

**Challenges/Limitations**
- Lack of evidence base; cost of systems; high volume requirements of systems
- Long term financial revenue capital transfer process; multi-level decision making process and interdepartmental groups involved decision making
- Insufficient supply of high cost patient groups due to static nature of system
- Lack of process following led to problems with tariff due to recalculation of maintenance and servicing costs
- Unexpected lack of treatment uptake

**Source:** Author
Chapter 7: Couplet Analysis

7.1 Introduction

Following the descriptive narratives of the six cases and outcome factors summarised in the chapter above, this section presents an in-depth comparative analysis of the cases drawing on the conceptual framework developed in ‘Chapter 4: Methodology & Research Design’. Drawing on the underlying assumption that institutional structures make a difference in the procurement and use of new technologies, the analysis seeks to conceptualise Scott’s regulative, normative and cognitive variables in the light of the different case outcomes.

Before going into the analysis of the cases, it is helpful for the reader to quickly recapture the definition and distinction of the three types of institutional elements. The regulative pillar refers to the system’s laws, regulations, contracts and enforcement mechanisms which are reflected in their effect as incentivising, mediating, arbitrating or litigating social behaviour. These regulative features often take a coercive form introduced through sanctions by bodies of authoritative power, such as the intervening role of Government as perceived in the Scottish case or the policing power of regulative organisations such as NICE or Clinical Commissioning Boards in the English cases. The normative variables are concerned with the socially shared understandings of expectations, norms and values of social behaviour. Examples of this variable in the cases are for instance the norms of vertical and horizontal collaboration in Scotland, in contrast to the perceived norm of competition and expectation to use competitive benchmarking for healthcare development in England. Violation of such normative features often leads to social sanctioning in the form of ridiculing, isolation or ostracism. An example of social sanctioning could be particularly seen in the Scottish case where the failure of collaborating with the Government would result into weakened relationships. Finally, the cognitive-cultural features are concerned with the individual or shared identities, beliefs and concepts which define differences in values or interests. The collective identity and strong sense of ownership of services perceived in the Scottish cases are good examples of this variable, as well as the more independent nature and silos of interest apparent in the English Cases. In contrast to normative features, cognitive features are more readily scalable and are reproduced through stories, scripts and unified imaginary as a means to frame actions and create a link to an individual or group’s sense of the self. Conflicting cognitive behaviour is often reflected in an individual’s act of self-punishment and ‘cognitive dissonance’
(Henisz et al., 2011). While Scott’s three institutional pillars are described and presented in isolation, it is important to take into account the very interdependent and mutually reinforcing nature of the variables.

The inherently different healthcare systems in Scotland and England, yet under the banner of the NHS, reveal important variations in institutional factors, which shine light on the individual adoption outcomes, actors and processes. The analysis will also take into account further potential intermediary factors, which cannot solely be explained through the conceptual framework. Belonging to this set of factors are organisational and technological characteristics such as the level of disruption and organisation size and type, which prove relevant and highly interdependent with the variables in the conceptual framework. The intervening variables however will not be the focus of this analysis. In the process of applying the conceptual framework to the empirical work, a number of issues in the operationalisation of those variables were identified. The limitations of the framework will be discussed in the concluding chapter together with suggestions for further development of the framework in order to cope with those shortcomings.

In what follows, the chapter will start with an in-depth analysis of the cases by applying the framework. The Figure 18 illustrates the process of analysis with reference to the interdependent relationship of the various variables in question. In doing so, this section seeks to contrast and compare the case outcomes as the dependent variable in the light of R. Scott’s institutional framework with its three types of independent “explanatory” variables. The outcomes, i.e. the nature of the adoption process and thus the ability and willingness of organisations to buy and use an innovation, are then explained through the influence of the three types of independent variables on actors and processes. In a first instance, the couplets are organised against the procured technology to reduce the probability of bias of technological factors, such as elements of technological change and potential disruption which may influence adoption behaviour and decision-making of the organisation, distorting the findings and focus of this study. Later on, the analysis will employ a broader view taking into account the institutional features identified within the three couplets to derive explanations and patterns across all six cases in ‘Chapter 8: Cross-case Analysis’, followed by a summary of findings and general lessons derived from the cases. Finally, the chapter concludes with reflections on the conceptual framework.
7.2 Case couplet analysis – Holmium laser

7.2.1 Regulative institutional factors

With a common history of origin until the devolution of the NHS in 1999, the cases present interesting insights into the impact of different institutional set-ups on the individual adoption behaviour. This section focuses on eliciting the regulatory factors manifested in the cases as the underlying rules, laws and power systems, which are marked by their incentivising, directing or constraining nature on the adoption and use of the robotic systems at the organisations.

7.2.1.1 Rules & laws: Regulatory incentives and constraints

The first set of regulative features apparent in this case couplet is the rules and laws established at system and organisational level. These features take the form of written set arrangements, which are legally binding and enforced on the local organisation and can facilitate, command or inhibit local adoption decisions.

Taking into consideration the sustained austerity agenda as a result of the economic and financial crisis, the two adoption cases revealed different national regulatory measures in response to the tight financial pressure. The regulatory measures therefore played a
significantly different role in each case, influencing the local incentive structures in investing in the Holmium Laser. With this in mind, the English case demonstrated the cost-saving initiative QIPP, a system-wide regulatory incentive to promote joint NHS saving targets of £20bn by 2015 (RCN, 2012). The initiative has particularly influenced the managerial level at the English hospital, seeking to delay the decision-making and hire the laser instead on the basis of initiating short-term efficiency savings. Initial responses to the idea of adoption were received with scepticism and “reluctance to spend all that money in one go” indicating a slight resistance to change at managerial level: “we are doing O.K. without the laser, why do we need it now?” (Trust Board Management). The national efficiency targets have therefore influenced the local incentive structures promoting a dominating financial culture at managerial level, seeking to hire the laser as a “more financially viable option for hospitals like us to start off with” (Consultant Urologist). To the consultant the hiring decision was perceived as merely redundant due to the accumulation of hiring costs, highlighting that “instead of hiring it once a month, we went to hiring it twice a month [...] so the hospital had to pay quite a lot more at the end of the day, when the hospital looked at the amount of money spent they realised ‘what are we doing?’” (Consultant Urologist). The hiring decision therefore presents a meaningful example of how the regulatory initiative has led to the six months delay in adoption, while increasing the overall costs to the hospital in the long-run.

The Scottish Government introduced a number of measures and strategies targeted at specific industry fields rather than a broader cost reduction initiative as launched in England. In the case of the Holmium Laser, the hospital was guided by the Government Equality Act and Quality Healthcare Strategy launched in 2010 (The Scottish Government, 2010; 2012), which set out the need to address local capacity problems through encouraging more efficient use of resources. In response to this the Scottish Government published a statement on strict local targets for implementing radical reduction in bed availability, which played a strong role in incentivising the hospital to implement changes to local service provision. As can be taken from the case narrative (‘Section 6.3 Holmium Laser (Case 2): Adoption at a Scottish NHS organisation’) the laser became a cornerstone to implementing the new changes as the hospital was “in fact reducing two acute hospitals in to one with half the number of beds which urged us to change the way we treat patients and the laser was a central aspect to this change as it allowed us to reduce bed stay from 5 days to only a day case” (Theatre Nurse). While the hospital was pressurised to respond to the strict waiting times targets, the statement offered flexibility in how to address the problem. The government statement has therefore created significant pressure on the hospital to consider the long-term implications of local healthcare delivery to meet the new stringent targets posed. The flexibility in accessing the financial support from the Government has proven to be a
particular facilitator as well as posing indirect pressure for the targeted use of the funds. Despite the high cost of the new laser, the technology was perceived as an important contributor to achieving more efficient healthcare delivery in the long run and reduced bed stay, in contrast to the perceived lack of interest in the English case.

A second regulatory factor apparently mainly in the English case was the NICE guidance on Holmium Laser prostatectomy, providing recommendations on the clinical and cost-effectiveness of the new interventional procedure (NICE, 2003). While NICE has recommended the laser as the new standard of care in the NHS, the guidance was not binding to local organisations and can be implemented or rejected to fit the need of the local services. With the flexibility in applying the NICE standards, the interviews highlight that the guidance did not play a pivotal role in the decision making. The procurement department in particular indicates that “we were not sure whether we were particularly impressed by the nice guidance” emphasising the importance of commissioner’s support and on-hand experience of other hospitals as “it was more a case of commissioners having experienced the holmium laser elsewhere and have been very positive about it, I think that was more which kick-started it really” (Hospital Accountant). The latter part further echoes the managerial drive for hiring the laser as a means to collect direct experience and evidence, which demonstrates potential lack of trust in external evaluation and guidance from regulatory bodies and higher risk aversion of the hospital in managing local investments. As indicated in the interviews, the hiring decision helped to achieve a smoother adoption transition from purchase to final use allowing “the laser to go straight into use once it arrived because we used to hire one before, and they were fully trained [...] and there was no great gap between the purchase and the use” (Hospital Accountant). The governance factor of NICE guidance has therefore had limited influence on the hospital’s decision-making for the laser, potentially outweighed by the stringent cost-reduction regime and the internal market in the English NHS which increased the hospital’s need for greater certainty and sustainability of local investments. The hiring decision has in turn facilitated a more sustainable use of resources for the hospital in the short term preventing the immediate total spent on the laser.

7.2.1.2 Governance & power Systems: Accountability lines

A second set of regulative factors significant for the analysis of the case couplet are the governance and power systems, which have influenced the local adoption behaviour of the two organisations. The types of governance factors discussed in this section refer to different types of control apparent in each case, in the form of accountability lines and
power relationships which can act as potential incentives or disincentives to adoption decisions.

One important feature of governance apparent in the English case is the more recent introduction of patient choice through the Governments Health and Social Care Act 2012 (DH, 2012). The notion of patient choice has led to increasing the patient voice vis-à-vis the choice and evaluation of healthcare services, which has acted as a particular incentive at the hospital under study to adopt the latest standard of care. The case particularly embodied the drive for being technologically advanced and improvement of services offered as highlighted in the interviews “The NHS is very much trying to as you’re well aware to focus on patient experience and actually moving and using technologies. It was an opportunity for our hospital to actually do something quite technically advanced” (Service Manager at the Clinical Business Unit). The strong clinical demand was therefore derived by the need to become leading edge in the use of new technologies in healthcare in response to improving patient experience and in turn improve the hospital profile to potential users and staff. In this instance, the internal market and notion of patient choice has therefore acted as a particular incentive to the hospital to actively pursue the adoption of innovation to stay “ahead of the curve” with the latest standard of healthcare. The notion of patient choice has worked in favour of the adoption, promoting the device as a technological advanced solution to increase patient experience.

The Scottish case, on the other hand, demonstrates a very different governance position, promoting incentives for integration and collaboration in local, regional and national decision making. The key regulative documents the case makes reference to the NHS mandate in 2012 as well as the Standards of Conduct, Accountability and Openness introduced in 1994. The mandate, in particular, was introduced to address a number of objectives on managing a wide range of chronic conditions based on recent statistics of the Scottish population, while emphasising the importance of driving clinically-led innovation through local collaborative partnerships. The notion of collaboration was particularly apparent in the Scottish case, emphasising that “Scotland is probably the size of one region in England, so we have the ability and luxury of working collaboratively and it is necessary that we work collaborative through the Scottish government directive” [Theatre Nurse]. Furthermore, the regulative feature of integration requires NHS organisations to incorporate national NHS targets into local priorities. The size of the Scottish NHS in this case represents an important intermediary factor to take into account contributing to the ability in working collaboratively across a smaller geographical space, opposed to the English NHS. Therefore, the NHS mandate could be said to have been a
considerable contributor to the **relatively fast** and **well-integrated decision-making process** in comparison to the English case.

“a unique **Scottish perspective on sterilisation** which is interesting as it is one-sided [...] The problem in Scotland was that the blind end tube you cannot put a brush through it, it brushes out and there was a concern regarding sterilisation when it came in contact with the prostate, which meant in a Scottish perspective that was they **could only use this tube as a single use** [...] It does mean you’ve got very nice sharp blazers to work very well but it does make a certain amount more expensive operation in Scotland than it is in the rest of the world. This is just a different surgical perspective and opinion on infection control **which I think is quite frankly wrong but I worked with it as a work here**” (Senior Consultant).

### 7.2.1.3 Governance & power systems: Monitoring and managing incoming ideas or equipment

As part of the governance and power systems, the case couplet made reference to the importance of system and organisational financial and monitoring arrangements, which played a major role in influencing the local receptiveness to and evaluation of new incoming medical equipment. These features are administered at system and local level in written and descriptive form, seeking to guide, direct and inform concerned groups and individuals on routine practices.

The English case in the first instance has introduced the notion of an ‘**internal market**’ through the NHS and Community care act (1990) (Stationary Office, 1990). The Act led to diverting the NHS budget to regional health organisations (today Clinical Commissioning Groups) as a means to ‘contract out’ health providers, through negotiable tariff rates against local performance targets such as number of procedures per year. The combination could be seen to incentivise health organisations to employ **competitive benchmarking** for improved patient experience and service performance against locally set healthcare budgets (Trueland, 2013). This phenomenon was particularly apparent in the decision making on determining the **value for money** in adopting the laser. Due to the **relative power** of the group in providing the funding for the equipment through proposed tariff rates, the CCG has proven to be an important point of reference for the Trust Board to evaluate the laser against current procedures. However, it is evident that the set governance system of tariff rates has significantly played an **impeding role** to the adoption of the laser, through promoting a **merely cost-focused approach** at the local hospital creating **resistance at managerial levels** to promote the laser across the hospital. As emphasised by the Theatre Manager the laser ”is not used every day. Primarily
only used in Urology who work 3 days out of 5 and we keep it quiet at the moment as we do not want all the clinicians to get excited about the new laser device but it can be used in other specialties if we had the equipment there” (Theatre Management, Clinical Business Unit). In this instance, the CCG therefore played an impeding role to the adoption of the laser, explaining the lack of interest of the managerial team to initially invest and allow the fully use of the procedure. However the negotiable nature of tariff rates could potentially act as beneficial to the adoption of new technologies, allowing room for flexibility in negotiating appropriate tariff rates to accommodate the financial and clinical needs of the hospital.

The Scottish case on the other hand receives a government-allocated budget derived from a systematic NHS Scotland Resource Allocation Committee (NRAC) formula determining local budget shares, based on a weighted capitation approach on resident population, local demographic circumstances and excess costs of services according to geographic area (NHS SRAC, 2005). The arrangement again reflects a stronger local reliance on central government to fund and perform local services, however promoting transparency in public health spending and local flexibility in the allocation of local funds, opposed to the negotiation process of tariff rates in England. The notion of transparency was further apparent in the hospital’s introduction of capital bids, allowing for a more open and fair distribution of internal resources, as well as a means to monitor and control the income of new equipment. The role of the bids became apparent in the interviews, facilitating “the medical devices group to have a method to assess the bid in comparison to other pieces of equipment” (Medical Physics Lead). In the case of the laser, the bid has led to the opportunity to formally apply for an investment based on a specific clinical need. The capital approach further highlights the highly collaborative nature of decision-making within the organisation, demonstrating the need for achieving a consensus of perspectives in the decision-making. The governance system of the NRAC formula and local capital bids therefore facilitated more systematic and effective evaluation of the laser in the light of the multiple perspectives involved in the decision-making.

7.2.2 Normative institutional factors

The following sections present the normative institutional factors embedded within the social system of each case, highlighting the norms, values, and authority systems which played a role in the adoption of the Holmium Laser. The underlying factors will help to identify the types of interactions and social patterns of behaviour evident in the two cases and explain the differences in adoption outcomes.
7.2.2.1 Norms, values and expectations

The first set of normative factors discussed in this section are the socially embedded norms, values and expectations. These features represent the underlying ideas, beliefs or ideals shared within the social system of each case and are reflected in the attitudes, behaviours, and interactions between individuals observed in the two cases.

As can be derived from the English case narrative, the notions of the internal market and patient choice have been highly internalised in the local Trust Board, presenting a more business-oriented approach to managing and delivering healthcare services to the public. The business approach was observed in the segregation of roles and responsibilities of individuals, demonstrating a mismatch in priorities and values especially between managerial and clinical perspectives. While the consultant sought to promote the long-term clinical benefits on the adoption to the Trust Board, the strong commercial influence at managerial level has led to the tendency in promoting a more short-term investment perspective based on priorities of cost reduction. This effect was particularly apparent in the discussions between management and the consultant as elaborated “the managers say ‘we cannot fund the sessions [...]’ and when we come back the argument is ‘this is actually going to give you more profit’ and they would not listen to it” (Consultant Urologist). The strong business-oriented and financial mind-set therefore presents a plausible explanation for the strong managerial resistance experienced by the consultant, indicating higher levels of uncertainty at managerial level on long-term investment plans. As highlighted by the Clinical Business Unit of the hospital “the cost was the main barrier. If you are going to invest in the laser device but it was around £200.000 for the device alone while the rest of the NHS is in Financial crisis, it is quite a lot to swallow for the Finance Director” with questions arising on “how do you put a value against that [investment] and put it in a tangible way to explain that this investment is going to provide financial benefits in the long-term, and that usually takes time” (Theatre Management). The dominating financial values of cost-reduction were further apparent in the strong drive for savings and financial improvements, as “there is much more emphasis on business rigour now within the NHS, which comes with the burden of everyday expenditure [...] and making sure we are actually getting reimbursed by tariff [...] and because of the pressure, everyone is looking to do things very quickly” (Procurement Lead). The norm of business rigour and values of financial returns has therefore led to a mismatch in priorities across managerial and clinical perspectives, significantly delaying the adoption process on the basis of the hiring decision.
The Scottish case, in contrast, the **collaborative directive** was deeply institutionalised in the local adoption behaviour indicating the **system-wide expectation of integration** and **norms of collectivity and collaboration**. The notion of collaboration was particularly marked during the decision-making process, demonstrating a **consensus** on the adoption of the Laser among clinical and managerial perspectives. The **clear consensus** was emphasised in the interviews as a “**lucky alignment of different people’s wishes and needs**” facilitating the coordination of “**a lot of drivers from different directions** which all pointed through towards using the money [...] there was the **general desire related to the reduction of patient bed uses and stay**” (Senior Urologist). The case therefore illustrates **values of transparency** for a well-informed decision-making process, achieving a **mutual agreement** across multiple stakeholders with little to no resistance observed. Furthermore, the notion of transparency might further be perceived as a hindrance to adoption, which led to the **tendency for higher risk aversion**. This was perceived in the initial bid application placed by the Consultant Urologist, demonstrating a tendency towards applying a more **tentative approach** in “appl[ying] for the 20 WATT machine **with the idea [to] subsequently make an application for the hundred Watt machine the following year**. So we put in a successful application for the 20 WATT machine but rather than take delivery I said to the health board look we really wanted is the 100 WATT machine could we just redo our application next year” (Consultant Urologist). The idea behind this approach was to reduce the risk of refusal through offering a more financially viable option to the Health Board, demonstrating a tendency to **risk-adverse** behaviour. From a managerial point of view, the acquisition of a 20 WATT machine was perceived as a **more risky investment in terms of costs and long-term use** as a more outdated version of the laser with limited features as indicated in the interviews: ”we put in a bid for a different laser [...] but what happened at the end is that the technology changed and they became convinced that there is no point in buying a 20 WATT laser despite it being cheaper, it wouldn’t do any of the procedures they wanted, so we changed the focus and said ‘okay let’s go for the 100 WATT, it might take longer in terms of training but in the **long-term that’s better for us and for patients.’** So the adoption probably took about two years” (Theatre Manager). The Scottish case therefore reflect the need for more **long-term planning** as a means to overcome reduce the ineffective use of resources. The norms of collaboration and integration have therefore had a mixed impact on the adoption of the laser. While the normative feature of collaboration allowed for a more well-informed adoption and mutual agreement of different perspectives, the transparent and more competitive approach of the capital bids on the other hand led to delays in adoption due to the need to investigate the long-term implications of adoption as a means to reduce risks.
7.2.2.2 Authority systems and obedience to duty

The second set of normative features relate to the different regime and authority systems and overall compliance levels observed in the two hospitals. These features are highly socially embedded reflecting the relative social power relationships observed in the accountability and level of autonomy of individuals.

As evident from the above discussion, the segregation of roles observed in the English case suggests a more hierarchical decision-making process with different levels of autonomy between individuals. The case particularly makes reference to an extensive conflict of interest between managerial and clinical perspectives, indicating reduced autonomy on the clinical side. This was apparent in the Consultant’s frustration and inability to fully use the device as “I honestly feel handcuffed in that regard despite having the laser available but not being able to use it when you want it. But that’s a fact of life” (Consultant Urologist). The case in particular makes reference to the need to control new incoming ideas promoting a more business-rigorous value system discussed above to avoid “surgeons being the main decision makers” and reduce the clinical autonomy. This has been further elaborated by the procurement lead “the old days of surgeons saying ‘Oh does it have a red button on it, otherwise we won’t want it’ they have gone. This doesn’t happen anymore […] it’s becoming much more of a Committee type of approach […] more professional […] and much more business like” (Procurement Lead). It is therefore clearly evident from the interviews, that the decision-making process was dominated by a more commercial and business regime at hospital, which indicates the internalised regulative incentive on competition and patient choice. Furthermore, due to the heightened managerial autonomy, the clinician revealed tendencies of strong championship as a means to ‘push’ against the resistance experienced within the organisation, echoed in the strong assertiveness of the consultant to “attend all the meetings so that’s probably very important part. He was a complete driver and he attended the executive meetings and all clinical advisory boards” to promote the technology (Service Manager, Clinical Business Unit). While the business rigour at the Trust Board has significantly reduced the consultant’s ability and willingness to pursue the adoption of the Holmium laser, the presence of strong clinical championship or facilitating roles to endorse the clinical need, has played a major role in driving the adoption at the hospital.

The Scottish case in contrast demonstrated a strong team approach as a means to work within a highly collaborative system with the involvement of multi-stakeholders in local decision-making, highlighted in the frequency of meetings and communication across
the clinical team: “We had local meetings and we have a lot of interplay with our colleagues within industry as well” (Consultant Urologist). The integration of multiple perspectives has therefore reduced the individual autonomy in decision-making, illustrating the need for more collectivity and bundling demand in the adoption of the laser. Furthermore, due to the clear vertical accountability links to central Government, the interviews illustrated high levels of compliance to the national directive for reducing bed stay. Therefore the hospital’s local autonomy is relatively low in contrast to the English case due to “the different set-up, [the Scottish government] can control and dictate how things are done that maybe Westminster wouldn’t have the same ability or degree of influence in England” [Theatre Nurse]. Another example of low organisational autonomy could be observed in the restriction by the national Infection Control recommendations to using single-use opposed to multi-use fibres for the laser, which significantly increased the cost of adoption for the hospital. This issue particularly illustrates the high levels of local compliance at the local hospital, expressing tolerance as “this is just a different surgical perspective and opinion on infection control, which I think is quite frankly wrong but I worked with it as a work here” (Senior Consultant). While the normative feature of integration facilitated the clinicians to benefit from the ability to bundle demand and collectively drive the adoption of the laser, the clear accountability lines to government and involvement of multiple stakeholders generally evoked lower levels of individual and organisational autonomy, which potentially results into more lengthy decision-making processes.

In addition to the regulative and normative factors, it is important to take into account the wider external contextual factors such as organisation type and size which further explain differences in the ability and willingness of the local health organisations. In relation to the English adoption case, the hospital is a district general hospital (DGH), characterised as the major care facility of a relatively large patient population responsible for providing the fundamental healthcare emergency services for intensive and long-term care. However, the hospital is smaller in size and less specialised than larger and more research intensive hospitals such as in the Scottish counterpart. The significantly smaller budget poses an additional constraint to the ability to invest in new equipment, illustrated by the need for sustainability and financial certainty in the interviews as “the NHS at the moment there is quite volatile, with all the changes all the time you are hearing private-sector intervention and all that type of things, you need some kind of sustainability within the trust our size” (Service Manager, Clinical Business Unit). The organisation type therefore further amplifies the mismatch between clinical in driving clinical values of becoming leading edge and managerial priorities on cost-savings, significantly reducing the ability and willing to embrace innovation. The Scottish case in contrast is more specialties focused acute hospital, specialising in emergency
services in a high demand and population-dense area. The pressure in managing fast patient demand is of particular importance to the Scottish case, highlighting the “major capacity problem in the hospital [...] which had a higher dependency of facilities through the intensive care unit” (Senior Consultant). Capacity management and bed stay have therefore been emphasised as vital performance measures, which has created a “general desire [to] reduc[e] patient bed uses and stay” (Senior Consultant) and a stronger drive for introducing new technologies to address the capacity issue. Together with the efficiency measure imposed by the Scottish Government and the local capacity problem, the hospital was able to achieve alignment of national and local incentives achieving a comparatively faster the adoption of the laser in comparison to the English case.

7.2.3 Cultural-cognitive institutional factors

Following the discussion of the regulative and normative factors above, the final section of this case is concerned with the cultural-cognitive elements which shine light on the underlying cultural factors that have shaped the adoption behaviour. The cultural-cognitive factors constitute of shared conceptions and meanings in the actions, relationship dynamics and interactions of individuals within each organisation.

7.2.3.1 Cultural-cognitive categories & identities

The first set of cognitive features identified in the cases is the underlying categories and identities, reflected in the behaviours and interactions of individuals. These features typically take the form of conceptualisations or generalisations and scripts of roles, processes and objects, formed as a means to guide, predict and make sense of social behaviour.

As discussed above, the English case has a more hierarchical decision-making structure, with heightened sense of **individuality** and **segregation** between different roles and responsibilities demonstrated in the initial mismatch in priorities between managerial and clinical perspectives. This segregation was particularly manifested in the cultural-cognitive dimension observed in the case, demonstrating **silos of interest** across different roles in the hospital, as illustrated by the critical perception of the clinical interest in the interviews: “If the clinicians make a decision they want to do AB and C, they sometimes don’t understand or see that these things go through multiple stages i.e. secure the funding for the equipment and so on, they just don’t understand why it can’t happen overnight (Theatre Management). The **disparity in perspectives** was further highlighted by the
Finance Director, indicating that “there were issues around [the clinician’s] sub-plan and the actual business case. He hoped to treat a certain number of patients but he needs to dedicate certain amount of time to treat the patients, which costs money, so there was a mismatch in expectations” (Finance Director). The cases therefore show a lack of understanding across the different perspectives, leading to silos of interest and disjointed decision making.

For this reason, individuals within the organisations established cognitive categories or stereotypes about colleagues’ roles and actions. An example of such labelling could be observed at procurement level highlighting the terms “making profits is much more accepted than it was before as people can make a surplus or return or whatever and it never used to be. In the past you don’t mention that word because it’s a public service” (Procurement Lead). The interviews therefore make reference to the increasing profit culture in the English NHS clashing with the former clinical dominated culture, which has been primarily influenced by the internalised regulatory factor of the internal market and competition. While the clinical side supports strong ideas of passion and dedication to clinical excellence and improvement of services, requiring to adapt to the new culture of the NHS, acting as key product champions in driving the adoption as illustrated in the consultant’s perception of his role: “I think my job was then to show that which appears to be a financial burden that actually makes profit in the long run, a profitable investment which helps our organisation and helps our patient” (Consultant Urologist). The challenge in the cultural alignment led to delays in adoption due to reduced clinical ability to adopt and a lack of interest on the managerial side. Furthermore, the segregation in roles was observed in the clearly defined roles and responsibilities of individuals, observed in the interviews as a lack of interest and involvement of individuals beyond their own responsibilities: “once you know I dealt with it and done my bit of the pie, I can’t be linked with everything” (Procurement Lead). While clearly defined roles and process responsibilities can facilitate more efficient and faster decision making processes, the lack of integration in priorities observed in the case has led to conflict of interest, presenting a plausible explanation of the resulted delay in this particular case.

The shared value system apparent in the Scottish case demonstrates strong commitment of the hospital in meeting needs beyond the local organisation and population needs. The Health Board was particularly concerned about aligning national targets with local priorities indicating “there are a number of factors from the government we are focusing on [...] It is about openness, honesty and transparency and you take at all the values and apply them to all the steps and processes [...] and it’s why we do what we do” (Theatre Nurse_DK). The case therefore indicates a strong sense of belonging to the Scottish NHS system, leading to a more altruistic attitude of individuals to act in the interest of
the wider needs of the Scottish NHS and patients. This type of commitment was particularly apparent in the main consultant’s involvement for promoting the adoption of the laser, despite the awareness that he will be retiring from the organisation prior to arrival of the technology: “I was intimately involved with the procurement and the initiating the commissioning but never operated myself on this equipment because I realise I was coming to the end of my stay and I wanted my colleagues to develop the skills and to do the new stuff and they were happily and willing to do it, so I was able to take a backseat once the equipment had been commissioned and infrastructure was ready to go ahead” (Consultant Urologist). The shared value system apparent in the Scottish case therefore had a positive impact on the adoption, through facilitating strong motivation of individuals to drive innovation adoption as part of the wider need and interest of patients.

7.2.3.2 Cultural-cognitive – Structural isomorphism & risk aversion

The second set of cognitive features relevant to the case couplet is the level of idiosyncrasy and distribution of risk aversion in the two cases. This feature refers to the level of similarity between organisational processes and structures within the same system, which can be determined by the level of interactions and distribution of risk aversion across individuals and organisations.

The devolved accountability structure and notion of competition in the English NHS has been particularly apparent in the cultural-cognitive dimension in the case. The interviews indicate the more idiosyncratic local nature of the organisation through the strong local focus on investments and strategies, setting “the strategic case, reflecting where we are at the moment and what are we proposing, the consequences of not changing and what are the measures of success associated with that change” (Director of Finance). The strong levels of idiosyncrasy of the hospital further indicate higher local risk aversion due to the high level of local independence and idiosyncratic nature of organisations, delegating the responsibility of risks to the local organisations. In the case of the holmium laser, the local responsibility for risk management could be established in the need to collect first-hand experience on the use of the laser through the hiring decision, indicating a more financially risk-adverse approach in evaluating the income of new technologies. As highlighted in the interviews, the hiring decision offered “a financially viable option for hospitals like us to start off with” (Consultant Urologist), with the “objective not to waste money and make sure we get a decent return. The chief executive wants to make sure we get value for money, It’s the strategic thing to do” (Finance Director). While the cultural-cognitive feature of local risk-aversion has facilitated more certainty in
decision-making for the new device, the approach led to a 6-9 months delay in adoption and accumulation of revenue costs. The case therefore further indicates a lack of sharing evidence and experience from the consultant’s previous use and external evidence, leading to duplication of work of the readily available evidence bases.

The Scottish case in contrast culturally reflects the centrally promoted notions of collaboration and integration of national, regional and local priorities, which suggests a strong local internalisation of the central agenda. The high levels of integration therefore signify more similar local organisations and a general desire for more standardised local healthcare services across Scotland. Due to the strong levels of integration of national, regional and local priorities, the Scottish case makes reference to relatively low levels of local risk aversion. The direct accountability lines to the government and directive in reducing bed stay particularly promoted a sense of urgency at the local hospital in addressing the problem, which presented a sense of certainty and overall reduced local risk perception. For this reason, the motivation of the local organisation in integrating the Laser into the local development plans was significantly high, significantly facilitating the adoption process. In conclusion of the analysis of institutional factors across the two cases, the following Table 5 presents a summary of key findings from the cross case analysis of the Holmium Laser cases above.
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7.3 Case couplet analysis – Robotic Surgery

As can be seen from the Robotic surgery case couplet analysis in 'section 6.4 Robotic Surgery (Case 3): Adoption at an English NHS organisation' and 'section 6.5 Robotic Surgery (Case 4): Adoption at a Scottish NHS organisation' the two adoption processes showed very different features affecting the outcomes of the cases. In the following this section is to establish the underlying regulatory, normative and cognitive features apparent in the cases, which played a role in influencing the different adoption outcomes.

7.3.1 Regulative institutional factors

The regulatory factors manifested in the cases are rules, laws, governance and power systems, which proved to be significant in influencing the adoption outcomes. The impact of these factors are reflected in the cases in the form of incentivising, directing, or constraining the ability and willingness of the organisations to buy and use the robotic system, and will be discussed in turn.

7.3.1.1 Rules & laws: Regulatory incentives and constraints

The first important feature within the regulative rules and laws is the Improving Cancer Guidelines published by National Institute for Care Excellence (NICE, 2002). The body is officially tasked with providing healthcare improvement recommendations to organisations within the English and Welsh NHS, with local flexibility in considering the guidance. However the guidance was equally considered in the Scottish case, assessed by the Scottish Government on its applicability on local services. For this reason the guidance played significantly different roles in the two cases, acting as a clear local constraint to the English case while playing a more informative role in the Scottish case.

The English case was primarily constrained in the full use of the robotic systems due to the NICE restriction to perform robotic surgery in high volume cancer centres. The guidance particularly highlights the need to perform at least 150 surgical cases per year to achieve cost-effective use of the robots for common high volume procedures such as prostate cancer surgery. For this reason NICE recommends the use of the robot at high-performing surgery centres to guarantee the full use of the systems. As a small medium sized acute hospital, the intervening variable of organisation characteristics such as its size and population were the main reason the English hospital was unable to demonstrate the recommended surgery volume to achieve a prostate cancer centre status. On the basis of this disadvantage, the supplier of the systems described the hospital as an
“unusual candidate” for the use of the robot, due to the lack of surgery volume potential based on the relatively small patient population. As demonstrated in the interviews the hospital “was hampered by the fact that we weren’t supposed to be doing [radical prostatectomy] and we couldn’t do them open either. The procedures were seen to be done in larger units.” (Consultant Urology). The guidance therefore played an impeding role in the ability of the hospital to fully use the robot, acting as an initial obstacle in the use of the robot particularly in the area of prostate cancer as one of the major areas of use at the time. However, despite the restriction laid out in the guidance, the hospital was determined to adopt the robot with the hope to overcome the restriction in the long-run by being the first hospital in the North-West to pursue the adoption of the robot. Due to the non-binding nature of the guidance the hospital was able to exercise a comparatively high level of autonomy, leading to more local flexibility in decision making and low levels of local compliance to the national guidance presented.

In the Scottish case there was no regulatory requirement to consider the NICE recommendations in the decision making for robotic surgery in Scotland, yet the guidance played an important role in the strategic planning of a national roll out for the implementation of robotic systems. Despite the NICE recommendations reviewed by the central government, the evidence base for the robot was judged as “not strong enough” (Scottish Government) to support the cost-effective adoption of the robot. The Government expressed the requirement to undertake further research to apply the guidance on the local context of Scotland, based on the risk of not achieving the required volume potential of 150 cases per year. For this reason the government mandated all Health Boards to withhold from the adoption of the systems until the evidence has been officially reviewed and published by the government. In reference to this, the Scottish case also signals the importance of the geographic profile of the adopting organisation in relation to the adoption of robotic surgery, referred to as the entire NHS Scotland. With approximately 5,000,000 inhabitants, the size of Scotland comprises the size of a smaller region in the NHS England, shining light on the Government’s motivation in addressing questions of equity and scale to accommodate the current 400 prostate surgery cases undertaken yearly in Scotland. The case therefore reveals comparatively high government involvement in the local planning of healthcare services, considering the robotic acquisition as a central question. The need for further evidence base signifies a more risk-adverse central government in comparison to local organisations, triggered by the central requirement to achieve a national approach on the roll-out”(Scottish Government). This argument is particularly interesting in contrast to the response of the local Scottish hospitals to the lack of evidence, revealing a more tolerant attitude in the local decision-making process which
was based on “more of a feeling and judgement than the hard science behind it” (Divisional General Manager).

The discrepancy in central and local attitudes to risk can be illustrated in the government’s concern on the “complexity, scale and potential impact” of the technology, requiring “a higher level of scrutiny” (Scottish Government). The Scottish case in particular makes reference to the disruptive element of the technology proven to be an important lever in determining the level of government involvement in the local adoption agenda. As a high cost, multi-speciality and high volume surgical system, the Scottish government sought to promote systematic adoption across NHS organisations to avoid random and inefficient investments perceived in England “where the robots may not be as well used as hoped” (ibid). While the NICE guidance acted as an informant to the central agenda of the government, the hospital was indirectly constrained by the guidance leading to significant delays in the decision-making due to the central involvement and their additional request for further evidence. The centrally moderated systematic roll-out of the systems therefore reduced the local ability in freely adopting the technology, limiting the adoption to a centrally authorised number of selected regions in the country to avoid ineffective and unequitable use of the robots. On the other hand, the strong government involvement in the decision-making can be seen as a means to achieve more careful evaluation of the adoption leading to more cost-effective use of the systems at selected local organisations.

7.3.1.2 Governance & power systems: accountability lines

A second set of regulative factors significant for the analysis of the case couplet are the governance and power systems, which have influenced the local adoption behaviour of the two organisations. The types of governance factors discussed in this section refer to different types of control apparent in each case, in the form of accountability lines and power relationships which can act as potential incentives or disincentives to adoption decisions.

The first important features of governance apparent in both cases are the national laws and acts which led to differences in local incentives in adopting the robot. A major national act apparent within the English case is the NHS competition law, drawing on the idea of market forces observed in the private sector and the notion of patient choice. The law particularly reinforces the role of the patient as a “customer” and central evaluator of local NHS services, against which local organisations are expected to benchmark and adapt local services to meet patient’s demand. The influence of this law was demonstrated in the particular drive of the local hospital for promoting innovation and continuous improvement
across the organisation. Clinicians particularly emphasised the importance “to become established as a major centre to receive justification to get a robot” motivated by the drive “to stay ahead of the curve to attract some good staff and keep your services in-house” (Consultant Urologist). In this instance the law acted as an incentive to remain competitive among other hospitals through benchmarking on the newest type of care and technologies to attract new staff and patients to the hospital. To ascertain the effect of the law on local services, the patient demand proved to be a strong influence on the adoption through demonstrating clear “willingness to travel to receive a robotic operation instead of a laparoscopic operation” (da Vinci Robot Supplier). The English case reflects a relatively open market, leading to more local autonomy in decision-making driven by the influence of centrally induced patient choice and competition. The law therefore translated into a particular incentive at the local hospital to foster innovation as strategic tool to compete on patient choice, demonstrating a positive impact on the ability and willingness of the organisation to adopt the robot. On the other hand, the more competitive landscape also led to more random adoption across the country, with a tendency to forming “post-code lotteries” on the access of the robots to the patient. The supply of new services is therefore deeply dependent on the general patient demand and on the competitive profile of the hospital and region, which explains the reason less emphasis was placed on equity and achieving high volume surgery. In contrast to the Scottish case, promoting a systematic implementation of the systems according to regions, the notion of patient choice hypothetically diminishes the regional boundaries of patient access. The services of the English hospital are therefore not anymore limited to the local patient population but dependent on the hospital’s ability to retain and attract patients from across the country for the use of the robot.

The adoption in the Scottish Case was influenced by the national statutory requirement to collaborate across local and regional organisations and government as stated within the Health and Social Care Act 2002. The act reinforces the underlying idea of collectivity and integration on questions of central importance such as the da Vinci Robot. The decision-making for the robot proved to be a highly collaborative process, involving the regional North of Scotland Planning Group and the NPF to integrate the perspectives of other Health Boards in Scotland as well as important stakeholders such as the public and networks. The notion of integration and collaboration was further reinforced through the rules laid out in the Standards of Conduct, Accountability and Openness in 1994, explaining the highly integrated nature of the system and central involvement in the decision-making. The case therefore reveals significantly reduced local decision-making power, where the autonomy tends to be shared across a wider number of stakeholders, with “a degree of control from central government” (Scottish
Government). In combination with the strong vertical autonomy and government mandate to withhold the adoption, the local hospital was required to “wait [...] for the government to give the green light” (Deputy Finance Director). The strong accountability lines introduced through the Standards of Conduct therefore significantly restrained the hospital’s ability in locally pursuing the adoption of the robot, dependent on “how long the government drags its feet for, and that can be as long as a piece of string” (Consultant Urological Surgeon). The hospital was essentially dependent on and held into account by a wider network of stakeholders involved, specifically by the Government’s final decision to approve the adoption. While the notion of integration of local, regional and central perspectives led to reduced local autonomy in adopting the robot which significantly delayed the decision-making process, the collaborative element was able to act in favour to promoting the full use the robot once adopted. This argument is particularly supported by the frequent flow of information and knowledge between the various stakeholders, leading to better informed decision-making and increased ability to collaborate on the nation-wide implementation and use of the robot.

7.3.1.3 Governance & power systems: Monitoring and managing incoming ideas or equipment

As part of the governance and power systems, the case couplet made reference to the importance of system and organisational financial and monitoring arrangements, which played a major role in influencing the local receptiveness to and evaluation of new incoming medical equipment. These features are administered at system and local level in written and descriptive form, seeking to guide, direct and inform concerned groups and individuals on routine practices.

While the robot in the English case was purchased with the help of an external charity organisation, the ability and willingness to fully use the robot has been particularly influenced by the tariff arrangements by the regional Clinical Commissioning Group (CCG). The CCG is an intermediary organisation between local organisations and government which devolves the responsibility for NHS budget to regional procure local health services through setting direct tariff rates with hospitals against local performance targets. For the adoption of the new robot system, the hospital was therefore required to involve the CCG as a means to receive ongoing funding for the new procedure. While the funding arrangements allow for flexibility in adjusting funding rates according to local healthcare costs of a certain procedure, the arrangement can equally act as a barrier to adoption if tariff rates are too low or a specific procedure is not supported. This is particularly the
case for robotic surgery as a relatively new service to the NHS, signifying the lack of standardised tariff rates. The hospital was therefore faced with “incorrectly coded tariff rates for robotic surgery”, which resulted in an inappropriately funded service limiting the organisation in the number of cases able to perform on the robot per year (da Vinci Robot Supplier). Furthermore the CCG limited the “funding to about 20 cases a year in each specialty” due to the high revenue costs of the device (Innovation Improvement Lead). As evident in the case narrative, the CCG acted as a barrier to adoption to the organisation significantly restricting the full use of the robot to a limited set of cases per year in the specialties of colorectal, gynaecology and ear, mouth and throat. The governance feature of tariff rates has therefore had a negative effect on the ability to fully use the systems by preventing the hospital achieving 150 cases recommended by NICE to make the procedure cost-effective.

In the case of the Scottish hospital, the total local health budget is directly assigned by the central government systematically calculated with the help of the NRAC formula, based on the hospital’s geographic profile and provision of local services. While it is the responsibility of the LHB to allocate the budget to the individual hospital divisions, the “top down nature of the budget allocations, [leads to] the government ha[ving] much more control of how the money is spent” (Procurement Lead). The top-down nature of the Scottish system therefore signifies stronger lines of responsibility of the government for the performance of local health services. This governance feature was particularly apparent in the government’s introduction of new waiting time standards and funding support in response to local capacity issues in 2011. The funding acted as a particular incentive to the hospital in investing in new theatre buildings to address the waiting times standards, while seizing the opportunity in building larger hospital space as a means to potentially accommodate the robot in the future. The combination of heightened central control and launch of financial incentives led the hospital to be more astute in its approach by proactively pursuing the local interest in the frame of national opportunities and boundaries. The financial support along with the waiting time standards therefore significantly facilitated the ability and willingness of the local hospital to prepare for the arrival of the robot through investing in new building work.

7.3.2 Normative institutional factors

This section is concerned with discussing the features of the normative variable apparent within the case couplet. The features will be contrasted and compared in each case focusing on the underlying norms, values and authority systems reflected within each social system. The underlying features will shine light on the nature of interactions
between individuals and groups and lead to social patterns of behaviour which will help to explain the differences in the couplet’s case outcomes.

7.3.2.1 Norms, values and expectations

The first set normative features discussed in this section are the socially embedded norms, values and expectations, which have been abundantly reflected in the interactions and actions of individuals within the local organisations.

The competitive landscape promoted within the English NHS system has had a particularly strong influence on the local adoption behaviour. The adopting organisation revealed the need for competitive benchmarking as a strategic tool to demonstrate the same or better healthcare services than neighbouring hospitals. As evident from the interviews, the adoption was particularly influenced by the system-wide expectation in the NHS England to attract funding from commissioning groups, which was demonstrated in the hospital’s ambition to adopt the robot was “to move forward and be progressive [advocating that the robot] is the better way to manage our surgeries” (Innovation Improvement Lead). The status and position of an organisation is therefore perceived as an important factor in maintaining or improving local health services as revealed in the hospital’s fear “to lose [its] population and then obviously the overall viability is affected by that. You do want patients to say that ‘I’m quite happy to go to [this hospital], it looks good and seems to have reasonable results and don’t appear in the news too often because that’s usually bad news.’”. Ideas of innovation and hospital status are therefore highlighted as a fundamental measure of success and performance, promoting a “moderately forward thinking Trust [and] relatively high performing organisation, [nominated with] the acute trust year award a few years ago” (Medical Director). The competitive nature of the system therefore facilitated a more ambitious and innovation-driven attitude within local organisations and promote the willingness to pursue and adopt new technologies.

In contrast, the Scottish case reveals a more collaborative approach, the decision-making was largely driven by the norm of integration and transparency across local, regional and national organisations. As can be derived from the interviews, the hospital automatically engaged in communication activities across wider networks involving regional and national decision-making bodies to share the local agenda. This was particularly driven by the national expectation to promote a common value system and congruent decision-making on large-scale projects such as the robot. Organisations therefore tend to be highly interdependent in pursuing local interests, influenced by the
expectation to **mutually hold each other into account** within an **NHS Scotland family**, driven by the pressure of other Health Boards expect the hospitals “**to hold the line [in the adoption of the robot] because of evidence and we have to act in the corporate Scotland-wide interest**” (Scottish Government). The integration of national norms and priorities therefore play an important role in local and regional decision-making, creating a more **cautious attitude of organisations** in considering the wider cross-regional implications of local actions. In the case of the robot, boards were encouraged to take into account the “**implications [the robot] has even for a big Board like Glasgow**” questioning whether one single Health Board has “**enough cases to make it cost-effective?**” (Scottish Government). The case therefore strongly reflects values of **equity** and **cost-effectiveness** as the main factors promoting the need to collaborate across organisations on the use of the robot to ensure consistent and systematic adoption in Scotland. While this normative inclination potentially helps to facilitate the full use of the robotic systems across the country in the long-term, the notion of a NHS Scotland family and mutual pressure in ensuring the national agenda leads to more **interdependent organisations**, significantly reducing the local ability and willingness to adopt the robot in the short-term.

In comparison to the Scottish case, the strong levels of benchmarking and competition apparent in the English case lead to the **inability to engage in collaborative activities** with other hospitals. The clinician expressed particular disappointment in the **lack of enthusiasm of the neighbouring hospital to collaborate** on the use of the robot prostate cancer surgery, rejecting the proposal on the basis of “**getting their own robot**” as a regional centre for prostate cancer surgery. The neighbouring hospital was reluctant to forgo its status and rights as a cancer centre for collaborative arrangements on the robot “**as they thought if they started using our robot it would limit their chances of getting their own**” (Innovation Improvement Lead). The limited support and collaboration across organisations in the English NHS system reveals more an **inward focused attitude** towards innovation. The ability and willingness to adopt and use the robot is therefore **highly dependent on the individual hospital or trust and the internal knowledge and skills**, induced by the promoted values of **elitism and patient demand**. The competitive nature of the system therefore leads to more **heterogeneous organisations in skill and performance** which in this case has helped to facilitate the hospital to adopt the robotic system. On the other hand, the competitive benchmarking has also proven to be a hindrance to inter-organisational **collaboration**, in which case the **ability to fully use the robot was significantly affected**.
7.3.2.2 Authority systems and obedience to duty

A second normative feature is the different authority systems and the obedience to duty observed in the adoption behaviour of the hospitals under study. The deregulated and competitive nature of the English NHS system has reinforced more independence in local organisations from government, leading to higher levels of autonomy in local planning and decision making. The robot was therefore a pure “local clinical decision to get it provided. It might be influenced by the external, but it is very much decided whether internal hospital needs it” (Consultant Urologist). As can be taken from the interviews, the normative feature of deregulation and competition therefore influences local organisation in encouraging individuals to promote new ideas “people having ideas and wanting to progress things, they are very much encouraging ‘free-to-do-it’ approach” (Consultant Urologist). The hospital therefore reveals a particular inclination towards experimentation of ideas and avant-garde behaviour, motivated by the competitive need to become the leader in robotic surgery in the region and enabled by the high level of organisational autonomy. While this feature significantly promotes initiative taking within the organisation, the adoption of the robot was a merely speculative decision based on imminent evidence base, “starting with a blank sheet of paper because there weren’t any other trusts we could identify […] which is not always the best way of doing things as you can miss things out” (Chief Business Analyst). The quote particularly reflects a lack of control mechanisms in place to properly assess the evidence base for the robot, which in turn explains the problem experienced with tariff rates, due to the improper calculation of revenue costs.

Furthermore, lower levels of compliance to processes and regulations could be observed, which has been particularly reflected in the ability to “wave the trusts standing financial instructions with the agreement from the chief executive and financial director” (Head of Procurement and Logistics). This was particularly marked by the different levels of autonomy observed across the organisation. The Trust Board and Directorate level revealed more flexibility in decision-making demonstrating the ability to undermine the Trust’s governance processes such as the financial instructions and marginalising certain individuals on purpose such as the Trust Chairman on the basis of “[not being] terribly forward thinking when looking at adoption strategies” (Medical Director). Similarly, the procurement department stated to have been involved only in the latter stages of the adoption, approached by the Chief Executive for the review and signing of the contract: “he didn’t come to me with the specifications to procure a robot for me [instead] they already decided what machine they wanted […], they wanted the contract signed an in place within a couple of weeks” (Head of Procurement and Logistics). The late involvement of the procurement department has
therefore caused the hospital to buy the robot on **unfavourable terms of conditions** as a result of **significantly increased bargaining power of the supplier**. The low levels of compliance were equally observed in the hospitals determination to adopt the robot despite the national recommendation by NICE to focus the adoption of robotic surgery in larger cancer centres, mentioned in the regulative dimension above. Therefore, the high levels of flexibility observed in the decision-making on the one hand significantly **empowered individuals** within the hospital to pursue the idea of adoption, while adoption outcome is **highly dependent on attitude and capabilities of individuals**, in assuring the proper assessment of the technology.

The Scottish case in contrast reflects **stronger dependency on central direction and support** on larger projects such as the da Vinci Robot, indicating higher levels of compliance to national and local regulations. This has been the effect of the normative authority system represented within the case, reflecting **psychological pressure of organisations** vis-à-vis the Scottish Government, holding organisations into account through strong **relationship links** observed in the case. As revealed in the interviews with the Government, “**there is no specific mechanism to bring Health Boards into some kind of book for adopting the robot against the national recommendation**” (Scottish Government). However organisations are widely aware of the **power relationships** in the NHS Scotland and the risk in “**suffering consequences of relationships**” with other Boards and government (ibid). Therefore the strong obedience to duty and central guidelines is further enhanced by the underlying **psychological pressure** and the **importance of relationships** and **interdependency** of organisations in Scotland. While this normative pressure has helped to facilitate **congruency and systematic planning** in the adoption of robotic surgery in Scotland, Health Boards perceive particularly **low levels of autonomy** affecting their ability to freely pursue the adoption of the robot.

7.3.3 Cultural-cognitive institutional factors

The final section of this case couplet will focus on discussing the cultural-cognitive elements derived from the cases. This dimension is concerned with identity and belief systems. This cognitive dimension will help to establish a more in-depth understanding of the underlying cultural factors which have shaped the adoption behaviour, dynamics and relationships of individuals within each organisation.
7.3.3.1 Cultural-cognitive categories & identities

The first set of cognitive features deemed significant in the cases is the notion of categories observed in the actions and relationships of individuals within the hospitals under study. The English case was particularly marked by a more volatile yet more autonomous environment in which various power dynamics between individuals could be identified. As can be derived from the above discussion on normative authority systems, individuals within the English case were particularly restrained by different levels of autonomy in decision-making, suggesting more bureaucratic types of relationships. This was observed in the individuality and discrepancy of identities in the organisation. The interviews reflected this phenomenon in the use of categorising and stereotyping other roles within the same organisation, illustrated in the reasoning for excluding the chairman in the decision-making at the Trust Board level referred to as “narrow-minded [...] and not particularly forward-thinking” (Medical Director). The decision-making within the Trust therefore demonstrates a lack of collaboration between clinical and managerial perspectives on the board, leading to particular silos of interest, through excluding or limiting the information flow between certain individuals within the organisation, such as the chairman. The case reveals a rather clinically driven view in supporting the idea of robotic surgery against the more financial and operational perspective put forward by the chairman. As perceived in the interviews, “there was a mal-alignment of clinicians’ views of where they wanted to be in terms of cutting edge technology and some people on the board” (Medical Director).

The formation of silos of interest could be further observed in the competitive nature of individual organisations, reflected in the lack of interest of the neighbouring hospital to share information and collaborate on the use of the robot. While the surgeons of the two hospitals were described as good colleagues in the past, the collaborative efforts of the adopting hospital has led to “costing me too much problems in relationships between me and the department in the neighbouring hospital that I don’t want to do it” (Consultant Urologist). The silo of interest was particularly observed on the basis of competition which has led to the formation of professional jealousy between colleagues and clinical staff across organisations. The latter was further confirmed by the supplier of the technology “surgeons seem to be reluctant to share data and information on the use of the da Vinci Robot. There seems to be a sort of pride in their own outcomes” (Intuitive Surgical). The cognitive features of individuality and silos of interest have therefore had a mixed impact on the adoption of the robot. While demonstrating relatively strong levels of autonomy in the ability to exclude certain individuals in the decision making, supporting in principle a faster adoption and avoidance of internal conflicts, the formation of silos has proven to create reluctance...
in sharing information between individuals and organisations. This has consequently affected the potential full use of the robot at the adopting hospital under study.

The cognitive feature of categorising and stereotyping was equally observed within the Scottish case, however on a more vertical scale between government and local organisations. While the more collaborative culture of the system has facilitated a more shared understanding of central and local goals, the low levels of autonomy experienced by the hospital in pursuing local interests has led to a certain level of mistrust in the government’s projections. This conflict arose from the long delay in decision making imposed by the government in reviewing available evidence bases, which led to frustration and disbelief at organisational level on the adoption. In response to the final approval of the robotic surgery in 2015, the driving consultant reflects this notion indicating, “I will only believe it when [the robot] actually appears in theatre as there is no sign of the money or order yet […] as you don’t know how long they will drag their feet for” (Consultant Urologist). The lack of trust could potentially have a negative impact on future collaborative activities across vertical and horizontal organisations, however no such observation was made in the case. Furthermore, the cultural-cognitive feature of stereotyping was observed in referring to the perception of the robotic technology as a “typical toy for the boys, perceived as the next gizmo to surgeons” (Divisional General Manager). This reflects the strong level of scrutiny apparent in the case in assessing the image and evidence base of the robot to avoid being misled by the technological trend promoted in the media and other organisations. This view was particularly adopted by the central government referring to the power of the “media and cultural perception of science innovation and technology […] automatically presenting all that stuff as big and sexy and exciting” (Scottish Government). The notion of categorising and stereotyping was therefore particularly observed on the evaluation of material things, explaining the strong emphasis on evidence collection to avoid the adoption of the robot to be based on pressure by media and social pressure. While the cautious nature of the system has allowed for more systematic implementation plans to fulfil the full cost-benefit potential of the robot, the high level of scrutiny has significantly delayed the adoption decision of the robot, leading to particular mistrust and frustration at the local organisations.

7.3.3.2 Structural isomorphism & risk aversion

The second set of cognitive features relevant to the case couplet is the level of idiosyncrasy and distribution of risk aversion of the two NHS systems and relative hospital in question. As can be taken from the above discussion, the hospital in the English adoption case proves
to be highly independent from central government and other organisations within a more deregulated and competitive NHS system. With limited ability to collaborate apparent within the case, the hospital particularly relies on internal knowledge and skills in pursuing the adoption and full use of the robot, signifying potentially high levels of idiosyncrasy in skill and ability between different organisations. For this reason the hospital established the individual Innovation role as a means to promote the adoption of new technologies in the hospital, which was perceived as “unusual as very few hospitals have any role like this [...] which is quite a personal role. I think most organisations should have somebody who focuses on innovation but currently they don’t” (Innovation Improvement Lead). The latter section of the quote especially shines light on the structurally independent nature of organisations, leading to highly individualised and independent organisations with more heterogeneity in skills and knowledge. The highly skill oriented nature of the English organisation was highlighted by the supplier emphasising “more advanced commercial procurement teams in England, which are directly employed from industry rather internally.” (Intuitive Surgical). While this had a positive impact in promoting more flexibility and creativity in the use of internal resources, the independent nature of organisations equally leads to a lack of standardisation across the system. This in turn has proven to reduce the ability of the hospital to aggregate demand and therefore lowering the negotiation power with external stakeholders, significantly increasing the supplier power.

As can be taken from the discussion above, the Scottish case reveals a completely different cognitive orientation through the more collaborative and integrated culture of the system, leading to more structurally similar organisations. The hospital reflects strong notions of communications across networks and organisations, indicating a high knowledge-sharing and adaptive culture, driven by internal peer pressure in holding each other into account to the national directives. The integrated nature was particularly apparent in the interview with the supplier, referring to “Scotland focusing a lot on theory frameworks which makes the adoption slower” following a more collective agenda of implementation through a national roll out (Intuitive Surgical). The strong role of government in the case and involvement of various local, regional and national stakeholders significantly reduces the hospital’s autonomy within an integrated system. On the other hand, the collective nature revealed in the case has had a particular impact in reducing the overall power of external stakeholders, significantly reducing the supplier’s bargaining power leading to a potentially more favourable contract agreement with the hospital. Furthermore, the strong central involvement and national roll-out in the implementation of the robot across Scotland has had a significant bearing on the risk-aversion observed in the case. The case particularly reveals a strong risk-adverse
culture at national level due to the vertically distributed levels responsibility of the large-scale adoption project, revealed in the strong need for evidence base and evaluation. As the argument suggests, risk aversion tends to be bared at central level on the basis of the large-scale effect of the technology, reflecting the impact of the technological variables of the level of disruption. The English case, on the other hand, demonstrated a more small-scale and random approach to the adoption of the robot, focussing merely on organisational factors such as the competitive environment and the individual knowledge and skills in determining the ability and willingness to adopt the robot. The risk in the latter case tends to be therefore bared primarily at local organisational level, highlighting the high notion of individual responsibility of each organisation. A summary of key features from the regulative, normative and cultural-cognitive cross case analysis of the robotic cases is presented in Table 6 below:
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7.4 Case couplet analysis – Fibroscan Diagnostic

As can be seen from the different case outcomes of the Fibroscan narratives in sections 6.6 and 6.7, the cases revealed very different features influencing the two adoption processes. The following section will present the underlying regulatory, normative and cognitive-cultural features which played a role in the adoption processes of the two cases, as a means to analyse the different adoption outcomes.

7.4.1 Regulative institutional factors

The regulatory factors observed in the cases constitute the rules, laws, governance and power systems, which proved significant in influencing the adoption outcomes. The regulative factors could be determined on the basis of the incentivising, directing or constraining nature on the adoption process, consequently influencing the organisation’s decision-making and purchasing behaviour.

7.4.1.1 Rules and Laws: Regulatory incentives and constraints

The first set of regulative features apparent in the cases are the rules and laws apparent at system and organisational level, which have influenced the adoption process in the two cases. These types of features relate to the written and binding and legally enforced arrangements, which can be determined on their ability to facilitate, command, and inhibit local adoption decisions.

In relation to regulative rules and laws, both cases made reference to published government reports and guidelines in the two nations, especially the Hepatitis C Action Plan in Scotland and Liver Mortality Report in England on national strategies in combatting the global liver disease epidemic, as a stimulus for local action and improvement (The Scottish Government, 2008; Beynon and Hungerford, 2012). However, despite the central focus on the severity of the issue, the two NHS systems promote significantly different measures in supporting the efforts of local organisation, which had considerable impact on the local capacity and incentives in adopting the Fibroscan. With an implementation period of May 2008 to March 2011, the Scottish Action Plan was of particular importance to the case due to the availability of an additional revenue funding stream to combat the low uptake of liver healthcare. The main purpose of the plan was to target patients suffering from deprivation, poverty and/or drug abuse through improving healthcare equity and access as part of the national QPI targets. This has vastly incentivised the organisation in proactively seeking ideas for improving current health services, as highlighted by the
supplier “The Hepatitis C Action Plan has vastly aided the adoption of Fibroscan across Scotland. Scotland has more Fibroscan per capita than anywhere else in the UK because it was money available [to] help people to purchase Fibroscan” (Echosens, Fibroscan Supplier). The earmark funding within the Action Plan has therefore provided a supportive infrastructure to the organisation and wider system, facilitating the adoption of the Fibroscan. However, as a revenue budget, the organisation had to submit an additional application to the government to “convince that the Fibroscan has the necessary requirements and meets wider needs” in line with the government set financial targets and expectations “monitored through local delivery plans” (Assistant Director of Finance). It is therefore plausible to say that the Scottish Government exercised a degree of flexibility in the use of the funds within a more regulated and integrated structure. As a result, the action plan has greatly aided the adoption, however signaling a tendency towards more complex decision-making processes due to additional paperwork and restrictions on the use of the funds.

The Action Plan in the English case, however, was published in 2004, which did not play a major role in the adoption of the Fibroscan in 2008/2009 (DH, 2004). However, the case made reference to the England Liver Mortality Report in the North West, published by the Department of Health in England, which incentivised the organisation on locally targeting the problem of high liver deaths. However, in contrast to the Scottish Action Plan, the regulatory framework in England did not include additional funding support, focusing merely on driving awareness and recommendations to improving local liver services. In contrary, the English hospital referred to the report as a strategic tool to benchmark against other organisations in the region on the adoption of the Fibroscan as a means to establish a competitive edge to become “one of the first in the UK to adopt [the Fibroscan] certainly in the North-West” (Consultant Hepatologist). This perspective can be traced back to the centrally enforced competition law, promoting the essence of competitive benchmarking and competition among other hospitals in the country and within a region. Furthermore the report served as a means to ensure greater urgency among local healthcare organisations to address the problem. Due to the more independent nature of local organisations, the Government only has limited power in directing or controlling local priorities and targets. For this reason the report was considered as more informative to the hospital in signalling “how big the problem the disease is in the North-West, and it will give you a breakdown of all the different places and you can tie in who actually has a Fibroscan and who hasn’t” (Consultant Hepatologist) promoting high flexibility in establishing local strategies to respond to the problem, opposed to the more targeted and controlled approach observed in the Scottish case. In the English case, the report therefore served as a specific incentive to adoption, driven by the need to remain competitive and patient focused. The lack of additional funding
support, however, led the hospital to focus on the use of internal resources, which significantly restrained the hospital in investing in the Fibroscan and led to a more financially vigilant organisation. This could be observed in the resistance to adoption at managerial and financial level on the basis that “there is no money available and nothing can get purchased [...] and they may say well that is a good business case, we would like to support it but the reality is we haven’t got the money” (Echosens Supplier Consultant). Therefore, the ability to adopt the Fibroscan was highly dependent on the individual skill and knowledge of the consultant in pursuing the adoption through an indirect route. On the basis of the lack of financial incentives on the Fibroscan in England led to more internally attuned organisations, with highly differentiated skills and financial capacity, which led to more random and varied adoption, in contrast to the Scottish NHS.

7.4.1.2 Governance & Power Systems: Interaction and Distribution of Autonomy

The second set of regulative features apparent in the cases are the governance and power systems, which have influenced the ability and willingness to buy and use the Fibroscan at the two organisations. The features of governance discussed in this section relate to the types of control and accountability arrangements in each system, which translate into potential incentives or disincentives to local adoption decisions.

As equally observed in the regulative factors of other two case couplets in ‘sections 7.2.1 Regulative institutional factors’ and ‘section 7.3.1 Regulative institutional factors’, one of the key features apparent in the English case for the adoption of the Fibroscan are the competition law and patient choice introduced in 1999. Patient choice significantly influenced the clinical decision-making in pursuing the adoption of the Fibroscan due to the perceived high patient acceptability and choice for the new procedure over traditional liver biopsies. As highlighted by the clinicians, “certainly patient acceptability has been very high and if you would offer them the choice between having a Fibroscan or biopsy, I had not anyone say I would like the biopsy again” (Consultant Hepatologist). The notion of patient choice has therefore worked as an incentive to the hospital in introducing the Fibroscan within the routine practice as a means to achieve higher patient satisfaction and overall improved hospital profile. The influence of the regulative feature of competition and patient choice was furthermore observed in the rather isolated decision-making process observed within the interviews, with little reference to implications of the adoption beyond local services: "the Fibroscan seemed to be useful tool in the hepatitis C setting and will be useful for us to use in our clinical practice, and that was an incentive" (Consultant Hepatologist). The strong focus placed on the local hospital profile and local patient feedback, can be traced back to the
more **competitive landscape** apparent within the English case, indicating more 
**independence** and **differentiation** in local health organisations. The principle of 
competition and patient choice has therefore had a positive influence on the adoption of 
the Fibroscan, **incentivising** the organisation to strive for clinical improvement and 
facilitating more autonomous decision-making.

The Scottish hospital in contrast pursued a more **integrated decision-making** with 
particular considerations of **cross-regional implications on equity of care and patient 
access** of the Fibroscan adoption at the local hospital. This has been particularly promoted 
by the statutory requirement to collaborate and Quality Performance Indicators (QPIs) 
introduced by the Scottish Government as a means to **promote nation-wide targets** of 
best practice for **quality, access and equity of care**. The adoption process within the 
Scottish hospital therefore strongly echoes this national ethos emphasising the need to 
**sustain standardised care** for all patients across the NHS Scotland: “So someone with 
the illness says like diabetes, hypertension or a blood-borne virus they have to **receive 
equity of care no matter where they are in Scotland** so they get the **same standard of care** 
that is monitored by the various Quality standards” (Infectious Disease Consultant). The more **collective approach** in healthcare delivery apparent in the 
Scottish case significantly influenced the hospital under study to consider the **wider 
implications** of the Fibroscan beyond local services.

### 7.4.1.3 Governance & Power Systems: Monitoring and Managing incoming Ideas or Equipment

As part of the governance and power systems, the case couplet made reference to the 
importance of system and organisational financial and monitoring arrangements, which 
played a major role in influencing the local receptiveness to and evaluation of new 
incoming medical equipment. These features are administered at system and local level in 
written and descriptive form, seeking to guide, direct and inform concerned groups and 
individuals on routine practices.

As highlighted in the above section, the adoption process at the Scottish hospital had to 
take into account wider regional and national perspectives in the decision-making for the 
Fibroscan. Following the statutory requirement to collaborate, the hospital involved the 
regional multidisciplinary Managed Care Network (MCN) to **collectively** discuss new ideas 
and plans of adoption among other clinical leads. The network played an important role as 
a governing system in **holding the hospital into account to the regional and national 
targets**. As highlighted within the interviews the MCN holds the **power in promoting or 
rejecting local proposals**, with the ability to “make suggestions about things that they
feel will be better for taking forward” (Public health Specialist). The network promotes current service providers and patient representatives to come together and “bring together on the topic of blood borne virus diseases “to address the need of people who are at risk of BBV viruses, such as Hepatitis C” NHS (2009). However, the highly multidisciplinary nature of the network led to the involvement of multiple stakeholders in the decision-making leading to high levels of interaction and potentially delays to the adoption. The interviews referred to the vigorous decision-making process, stating that “the business case had to go through all these folk and questions came back from them which had to be answered. So there were a lot of emails going back and forth on clinical questions, training, risks and insurance” (Public Health Specialist). The interviews highlight the strong levels of interactions brought about by the MCN indicating more distributed levels of autonomy and shared risk mitigation, which can be linked back to the cross-regional implications of the project. Therefore, the involvement of wider regional and national stakeholders tends to be dependent on the nature of the technology based on the degree of disruption beyond local health services. In relation to this, the governance feature of multidisciplinary networks has had a positive impact on the ability to communicate and exchange information about the new technology with other clinical leads, leveraging the distribution of risk for more complex projects with potential effects of disruption beyond local healthcare services.

The English hospital reveals a different type of governance, characterised by regionally active Clinical Commissioning Groups (CCG), responsible for setting tariff rates for local health services such as the Fibroscan. The importance of involving the board in the decision-making was emphasised in the interviews as a means to assure the application of correct tariff rates to fund the local revenue costs of performing Fibroscan clinics. The CCG proves to be a central element to ensuring the proper remuneration of the new Fibroscan services. However the group was not involved in the initial adoption process, leading to the absence of tariff rate calculations and had to be retrospectively addressed. While this proves high flexibility at local level to involve the governance group, the lack of tariff rates posed significant complications to the use of the Fibroscan as highlighted by the clinical nurse “the weight affected us in that we were thinking we were doing that many Fibroscan procedures here [...] we were actually saving biopsies and hospital bed stays and we all were a little worried that there is no funding getting in for it” (Theatre Nurse). The governance feature of tariff rates therefore plays an important role in the introduction of new technologies and services, as a means to facilitate adequate revenue funding and reduce uncertainty in the use of the new procedure. In this case the late application of this governance feature further reflects notions of uncertainty. The importance of this feature in funding new procedures was further highlighted in the interviews in reference to the extension of Fibroscan services to
community work, emphasising the need to “work with the commissioners on introducing community-based hepatology assessments in which the Fibroscan would play a major role” (Consultant Hepatologist). The local adjustment of funding for new technologies therefore exemplifies a more **decentralised** and **bespoke revenue funding arrangements** depending on local requirements and status. While this feature allows for more **local independence** and **adaptation**, the more **individualised funding arrangements** indicates a more varied local expenditure and potentially lead to **inefficient use of resources** at larger scale.

### 7.4.1.3 Standard operating procedures: Monitoring and managing incoming ideas or equipment

This section is concerned with discussing the influence of instructions or documents intended for performing routine activities at the local organisations to ensure consistency in procedures undertaken. These features are typically administered at the local organisation in written and descriptive form, with the aim to guide, direct and inform concerned groups and individuals on repetitive practices according to agreed specifications.

The standard operating procedure apparent within the Scottish case refers to the board operating procedures, which include the capital transfer facilitated through the Capital Charging process. The latter process was of particular importance to the hospital due to the need to access the allocated Hepatitis C Action Plan funds from the Government, which were only accessible in the form of revenue expenditure. The challenge in accessing the Action Plan funds was highlighted in the interviews, as “the Action Plan was revenue funding, however the Fibroscan was obviously capital funded equipment. So there was formula that we needed to fill out to access that Hepatitis C fund allocation for each Health Board, **which usually cannot be used for things like equipment or medicines**” (Blood Borne Virus MCN Manager). The capital charging process therefore provided the hospital with the opportunity “to put in an argument to purchase the Fibroscan as capital cost only” (Blood Borne Virus MCN Manager), allowing for a **degree of flexibility** within the internal standard operating procedures. As emphasised within the interviews, the standard operating procedures have been described as **typically strict** and a “**black and white kind of process**” (Assistant Director of Finance), requiring the approval from managerial, financial and other groups for the case, comprising of a total **five – six months** process. Despite the delay, the standard operating procedure of capital charging has had a positive impact on the adoption outcome, significantly facilitating the purchase of the Fibroscan through the external Government Hepatitis C fund.
The English case equally made reference to the standard operating procedures for the adoption of new medical devices, applied as internal hospital measures to control and assess the income of new capital equipment and spending. The process involved a number of multidisciplinary decision making committees within the hospital, formed on the basis of evaluating new proposals made by clinical consultants on the financial viability and technical aspects. However, the standard operating procedures were not fully acknowledged for the adoption of the Fibroscan, which led to the purchase of the device without approval from the given committees. As described within the interviews, the equipment was “bought through a carried conversation with a senior” (Director of Management), confirming that it was not uncommon that “in the past the equipment would just be bought and no one would have had a clue how it has arrived” (Purchasing Manager). A possible explanation of this phenomenon is that the committee process was a relatively new structure to the hospital, resulting into a lack of process following due to potential unfamiliarity or awareness of the new structures. However, there are some further important normative factors described in the following section which could shine light on potential low compliance levels to rules and processes. While the lack of compliance to the process enabled the relatively fast adoption and integration of the Fibroscan into the hospital services, the neglect of important financial and commissioning processes consequently affected the hospital’s ability to fully fund the ongoing revenue and maintenance costs Fibroscan. As a result the clinician had to resubmit “a retrospective application” with the adoption of two subsequent portable Fibroscan devices to correct the financial issues at stake.

7.4.2 Normative institutional factors

This section is concerned with establishing the normative features apparent within the two cases, referring to the underlying norms, values and authority systems within each social system. The features will help to shine light on the nature of interactions between individuals and groups and lead to social patterns of behaviour which will help to explain the some of the differences explored in the sections above and related case outcomes.

7.4.2.1 Norms, values and expectations

The first set normative features discussed in this section are the socially embedded norms, values and expectations, which take the form of underlying ideas, beliefs or ideals shared
within a social system. These features are therefore determined on the basis of the different attitudes, behaviours and interactions of individuals observed in the two cases.

As can be observed from the interviews, the regulative factor of collaboration and integration has been highly institutionalised within the organisation and cross-regional value system, apparent within the interactions within the various multi-disciplinary groups such as the Managed Care Network. As highlighted within the interviews, the group engages “people with an active interest in the topic and are involved in the delivery of services to promote equity in Blood-Borne Viruses holding different lines of responsibilities in the network, [including] clinical leads, local authorities, and patients” (Public Health Specialist). While the involvement of multiple stakeholders has played a major role in facilitating more informed and systematic adoption of the Fibroscan, the norm of cross-regional collaboration and integration of norms such as equity suggests more interdependent organisation, leading to low levels of local autonomy. Furthermore, the norms of collaboration and integration were further reflected in the national political system of the country, emphasising the influence of “quite a labour stronghold […] One of their jewels on their crown is the health services […] they like to have the same healthcare across Scotland which is quite rural” (Infectious Disease Consultant). The importance of standardisation of healthcare was therefore not only lawfully supported but also normatively reinforced through the national election of the labour party. On the other hand, the active engagement and motivation of individuals to collaborate facilitates rapid share of information and knowledge across different stakeholders, which contributed to establishing the initial idea of adoption on the clinical side. As highlighted in the interviews, the clinician has learned about the potential of the Fibroscan through communicating with other clinical leads at “wider national networks which consultants in particular attend and talk about new technologies. So it has been discovered out of the word of mouth” (Blood Borne Virus MCN Manager). Therefore, the interactive nature of the system has had a positive impact on the adoption of the Fibroscan, signifying the highly receptive nature of individuals to new ideas and innovation. The active engagement was further observed within the hospital’s procurement department, indicating he “became aware of the technology about 4 to 5 years ago at an exhibition […] but ha[sn]’t through of any application for it [and] one of the infectious disease consultants came to see [him] with his interest in staging liver disease” (Medical Physics Procurement Lead). The Scottish hospital therefore equally illustrates strong internal interactions within the organisation, demonstrating the need to establish a common ground and integration of clinical and managerial priorities. While the high levels of communications has significantly helped in driving the adoption of the Fibroscan, the hospital however reflects a more reactive approach to the adoption of new technologies, indicating “we
are doing a lot less adoptions than anticipated with careful management of financial and clinical factors” (Medical Physics Procurement Lead). Therefore, the highly integrated decision-making structure and consideration of the different perspectives can provide a plausible explanation for the slower adoption perceived in the Scottish case.

In contrast, the adoption at the English case was relatively fast and occurred within less than one year from the idea, procurement and arrival of the Fibroscan, which can be explained by the significantly different normative inclinations observed in the case. Following the low levels of compliance to internal operating procedures as can be taken form ‘section 7.3.1 Regulative institutional factors’, the hospital reveals a lack of integrated value system, with strong values of individuality and independence across organisations within the English Healthcare system. The limited communication levels across individuals within and outside the organisation during the decision-making process present a good example of these values, demonstrating the highly selective involvement of certain groups and individuals with strong values of relationships and trust as highlighted within the interviews “it went through no process and just got bought through personal relationships I’m afraid to say [...] as the clinician would have said to the director ’this is a really good idea’ to which he responded ‘I am sure we can sort that’ and this is how it happened” (Director of Management). Furthermore, the reason for the more selective involvement was the perceived discrepancies of perspectives, emphasising differences in priorities and value systems across the organisation, particularly excluding the finance and managerial committees in the decision making. The discrepancy in priorities and values was highlighted in avoidance to pursue the committee decision-making structure, which according to clinical perspectives “was fairly benign considering the fact that it was a non-invasive procedure” (Consultant Hepatologist), supported by the medical engineering perspective arguing “actually I think the business case that the fibroscan didn’t need one as it was a relatively low-cost item you did template will actually suffice” (Medical Engineering Manager). Financial and managerial perspectives criticised the lack of compliance to internal processes and contradicted the previous statement “the Fibroscan is £50,000 worth of money and not at all cheap” emphasising the need to correctly evaluate maintenance and servicing costs (Director of Management). The finance perspectives have therefore not been involved in the decision-making and business case evaluation, as emphasised in the interviews: “it was bought without a business case, they had actually written one, very in-depth but it hasn’t actually gone to the committee [...] it was handed to me in 2010, but it was actually written in 2009, but it must have been before that as we didn’t write it, it could even be 2008” (Director of Management). While the strength of personal relationships has helped to significantly accelerate the adoption process, the exclusive adoption decision...
taken between the clinical lead and senior executive led to avoiding the lengthy committee evaluation process and excluding financial perspectives in the adoption process, which consequently resulted into incorrect calculations of maintenance and servicing costs, contributing to the inadequate tariff funding.

7.4.2.2 Authority systems and obedience to duty

The second normative features discussed in this section are the different authority systems and obedience to duty observed in the adoption behaviour of the hospitals under study. These features relate to the socially embedded and recognised lines of accountability and autonomy apparent within the cases, determined by the level of compliance to rules and relative social power relationships exercised.

In relation to the authority systems and obedience to duty observed in the two cases, the narrative for the Scottish system describes overall more stringent vertical accountability lines and authority relationships between local, regional and national groups. The highly integrated value system observed in Scotland has played a particular role in collectively reinforcing and holding local organisations into account to cross-regional and national targets in the adoption of the Fibroscan. This could be particularly observed in the richness of negotiations between the hospital and the MCN, collectively discussing the idea of adoption against national targets through “regular meetings with other clinical leads to discuss the best practice [...] because the Fibroscan is a shared practice, we have got to know about other boards using this technology” (Consultant Helpatologist and BBV Clinical Lead). The latter quote particularly reflects values of commitment and responsibility to the NHS Scotland, indicating strong obedience to duty in respect to meeting the nationally reinforced priorities. However, the MCN decision-making process was described as a “more bottom-up approach, with initial introductions of new technologies made by clinical subgroups” (BBV MCN Manager). It is therefore plausible to argue that the highly collaborative nature of the system leads to reduced local autonomy in decision-making, yet revealing a strong clinical orientation towards the introduction and assessment of new technologies, which significantly helped to promote the adoption of the Fibroscan.

The adoption at the English NHS hospital in contrast merely involved specific individuals within the local organisation, opposed to collaborating across wider regional and national networks on the assessment and implementation of the Fibroscan. The case demonstrated more ‘uneven’ levels of autonomy across local decision-making stakeholders, particularly highlighted in the consultant’s ability to omit the internal committee structure by directly approaching selected individuals within the hospital with final
decision-making power, such as the chief executive and procurement lead. The latter not only indicated **low compliance to rules** of individuals within the hospital but also the more **flexible** and **creative capacity** of the system in pursuing the adoption based on **personal judgement** and ‘**common-sense**’. This could be observed in adoption process (‘section 6.7.3 The Adoption process – Idea, procurement to the use of the Fibroscan’) describing the flexible mind-set of the procurement department in clarifying the redundancy of a Business Case, further mirrored by the consultant “[the Business Case] was fairly **benign** considering the fact that it was a **non-invasive procedure**” (Consultant Hepatologist). On the other hand, the managerial and financial perspectives claiming to have been **neglected** in the decision-making emphasised the **strong levels of clinical autonomy** and **persistent attitude of clinicians** “when [they] say they want something they would try anything to get it and will use all means to do it, and they don’t think about the outcomes of the actions” (Director of Management). The case therefore makes reference to a **lack of integration of perspectives**, leading to **less informed** and potentially **incomplete adoption process** consequently leading to the miscalculation of maintenance costs and late establishment of tariff rates.

### 7.4.3 Cultural-cognitive institutional factors

The final section of this case couplet will focus on discussing the cultural-cognitive elements derived from the cases. This dimension is concerned with identity and belief systems. This cultural-cognitive dimension will help to establish a more in-depth understanding of the underlying cultural factors which have shaped the adoption behaviour, dynamics and relationships of individuals within each organisation.

#### 7.4.3.1 Cultural-cognitive categories & identities

The first set of cultural-cognitive features deemed as significant in the cases are the categories and identities within the two cases, which are manifested in the behaviours and interactions of individuals. These features typically represent generalisations and scripts in the form of stereotypes, concepts and ideas, which individuals have established to help to guide, predict and make sense of social behaviour.

In relation to the cultural-cognitive features observed in the couplet, the formation of categories in the form of stereotypes was particularly pronounced in the English case due to the apparent **segregation of roles** and **disjointed value system** between clinical and financial perspectives. The formation of stereotypes could be observed in the interviews
with managerial and financial stakeholders, generalising repetitive behaviour: “this is how clinicians work […] and they did a similar thing before with a breath test machine […] which then sat in a corner of the cupboard for two years” (Director of Management). The segregation of roles was further observed in the lack of awareness and interest of clinicians and nurses in the financial sides of adoption, which can be observed in the dis-integrated decision-making and business case process in the narrative (‘Section 6.7.3.2 The Business Case process ’). This was further emphasised at the clinical end-user level, indicating that “there is something up there which I don’t know much about” (Theatre Nurse). The English case therefore reveals cognitive-cultural features of segregation in roles and values leading to the formation of silos of interest, which particularly affected the ability and willingness of the individual stakeholders to communicate and pursue a transparent adoption process.

The Scottish hospital in contrast promotes a very different cognitive culture, with particular attention paid to collaboration and communication across all stakeholders in the decision-making, leading to more transparent and well informed adoption. This has been particularly promoted through the well-recognised structure of the decision-making process between the Managed Care Network, the Health Board and the local hospital. The case referred to the “first-time learning process” of this structure, highlighting a particular collective mind-set in “gearing towards the same outcome, which was a quite enjoyable process” (BBV MCN Manager). Furthermore, the strong sense of collaboration was further visible between the various departments, especially Finance and medical perspectives signalling “very strong support from the clinicians” (Assistant Director of Finance”. In contrast to the English case, the narrative for the Scottish hospital illustrates the highly integrated decision-making process, in which a common and shared vision on improving the Hepatitis C patient journey could be discerned across the local and regional organisations, which illustrates the highly institutionalised nature of the regulatory and normative frameworks discussed above.

**7.4.3.2 Structural isomorphism & risk aversion**

The second set of cultural-cognitive features relevant to the case couplet is the level of idiosyncrasy and distribution of risk aversion of the two NHS systems and organisations in question. This feature refers to the similarity of processes or structures between organisations within the same system, established in the level of interactions, risk aversion and interactions across individuals and organisations within one system.

As described in the above sections, the integrated and collaborative nature of the Scottish hospital case has generated more interdependent organisations held into
account through the wider regional and national networks. The Scottish hospital under study shows more structurally similar characteristics particularly apparent in the local adoption patterns across the country, referred to in the interviews as highly consistent and isomorphic. The strong government threshold in driving consistency and equity across Scotland is therefore deeply embedded into the local and regional organisational culture, emphasising the collective and adaptive conduct in the introduction of new technologies in Scotland: “either everyone will get it or no one will get it, but usually everyone will get [the Fibroscan] as it is a hot potato” (Consultant Hepatologist), which could be a further important contributor to the reduced levels of post-code lotteries across the Scottish NHS. Consequently, the more integrated and mimetic characteristic of the Scottish system reflect a tendency towards more shared levels of risk across the various decision-making stakeholders for the Fibroscan. This has been apparent in the distributed responsibility between the organisations in responding to the wider regional and national priorities or targets laid out by the Government as could be observed in the description of individual roles and responsibilities, which referred to the “overall responsibility for the funding that we get from the Scottish Government, which is the ring-fenced funding from the Sexual Health and BBV stream and we have turned a number of outcomes within that framework” (Public Health Specialist, Regional MCN Budget Holder). The risk aversion of adoption can therefore be said to be significantly reduced at local level due to the high levels of collaboration across Scotland, facilitating knowledge exchange and collective agreement of local projects.

The English case in contrast demonstrates a more competitive culture forming more distinctive and idiosyncratic organisations, which emphasises the more local levels of responsibility on healthcare performance. Not only do these arrangements create more structurally distinct organisations but also lead to a shift of risk aversion towards local organisations. This could be observed in the “critical responsive” reaction to the initial contact by the supplier, marked by the late interest in the adoption eventually developed “when they realised that more centres were actually acquiring Fibroscan and then they started looking at it with more interest” (Echosens Supplier, UK Consultant). This adoption behaviour was further mirrored at the clinical side in the hospital, describing the slow build-up in interest, indicating a more reactive adoption behaviour as “the technology has been on the liver horizons [...] about six years before we adopted it” (Consultant Hepatologist). It is therefore plausible to argue that the English hospital experienced more local risk aversion, illustrated by the initial hiring period prior to the purchase of the Fibroscan to generate more on-hand clinical data. This particularly reveals an inclination towards adopting an ‘observe and see approach’, which might potentially delay the adoption of new technologies based on the perceived level of local risk and uncertainty. The more independent structure of local organisation was equally recognised
in the interviews due to the **unequal adoption** of the Fibroscan across England as highlighted “that the Fibroscan has not been universally adopted, I think that there is not even one in Manchester” signifying potential **post-code lotteries** due to the **differences in the local priorities or capacities** of organisations “because of the more hospital financial environment maybe they haven’t been able to make the case” (Consultant Hepatologist). The adoption of the Fibroscan in England can therefore be argued to be highly dependent on the local skills, demand and priorities for investment at the hospital in question. Table 7 below presents a summary of the regulative, normative and cultural-cognitive features elicited in the couplet analysis for the Fibroscan above.

**Table 7: Summary of Institutional Features for the Fibroscan Case Couplet**

<table>
<thead>
<tr>
<th>FIBROSCAN SYSTEMS</th>
<th>NHS England Case 1</th>
<th>NHS Scotland Case 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Regulative</strong></td>
<td><strong>Normative</strong></td>
<td><strong>Cultural-Cognitive</strong></td>
</tr>
<tr>
<td>Operation: Competitive benchmarking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Governance &amp; Power Systems: Managed Care Network (NCIN)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Standard Operating Procedure:</strong> Standard operating procedures for the adoption of new medical devices (in this case were not considered an issue) – tendency of negating impact on local decisions</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Norm, value &amp; expectations:</strong> Norms, values &amp; expectations of individuality and independence; value of strong internal (other personal) relationships &amp; trust to execute decisions</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Incentives &amp; Incentives &amp; Expected Non-Payoffs:</strong> Incentives &amp; expected non-payoffs: - Shift of interest &amp; stereotyping between different positions of local decision-making</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Standard Operating Procedure:</strong> Structural Isomorphism: Institutionalisation of norms of collaboration on national standards i.e. equity across multi-disciplinary groups</td>
<td></td>
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<tr>
<td><strong>Categories &amp; Identities:</strong> Norm of integration and collectivity highly institutionalised at local hospital; reproducing a transparent decision-making process</td>
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</tr>
<tr>
<td>Authority Systems &amp; local Autonomy: “Competencies”, hierarchical distribution of autonomy, strong autonomy at the top/local managerial board level &amp; clinical level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structural Isomorphism: Highly isomorphic, distinctive, individual organisations driven by internalised competitive culture</td>
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</tr>
<tr>
<td>Authority Systems: Local Autonomy: Low, strong accountability links to government, flexibility to rule in using government funds with “bottom-up” approach encouraging clinical voice</td>
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<tr>
<td>Authority Systems: Risk Adversity: shared levels of risk and responsibilities to respond to national guidance: creates sense of standardisation and certainty in local planning</td>
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<tr>
<td>Authority Systems &amp; Obedience to duty: low obedience to duty due to strong personal relationships overriding “rules”</td>
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</tr>
<tr>
<td>Structural Isomorphism: Risk Adversity: higher risk adversity at local level, due to wide responsibility on local services, reactive adoption due to high levels of uncertainty in a competitive environment + lead to post-code lotteries</td>
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</tr>
<tr>
<td>Authority Systems: Obedience to duty: high obedience to duty due to strong sense of belonging, collectivity reinforcing national law and standards + interdependent organisation</td>
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<td></td>
</tr>
<tr>
<td>Structural Isomorphism: Level of isomorphism: structurally similar organisations due to collective and adaptive conduct – driven by value of equity &amp; consistency</td>
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Chapter 8: Main Results

8.1 Introduction

This chapter will zoom out of the individual cases as a means to present the broader picture of the relevant explanatory power and importance of each dimension in defining the adoption behaviour. Most importantly, this section seeks to elicit the underlying relationship and interplay between the institutional variables, presenting the key framework conditions and features that make a difference in the adoption of innovation in the light of the English and Scottish NHS systems. In doing so, the analysis seeks to understand the relationship between specific institutional arrangements and the organisational buying behaviour and adopting through deriving patterns of adoption. The analysis of the institutional interplay will further take into account other intermediary variables salient in supporting or influencing existing Scott variables observed.

8.2 Understanding the institutional set-up and interplay in the adoption of innovation

The following section will present the main findings from the in-depth case study analysis above, in particular focusing on filling in the two main research questions of this thesis on a) what are the main exogenous and endogenous institutional features that make a difference and b) understanding the interplay of the various variables involved. The aim is to understand the effect of the institutional set up on the adoption behaviour observed in the two systems, eliciting wider behavioural patterns and potential complementary or conflicting relations within the institutional interplay. The purpose of this PhD is not to evaluate and identify best practice of the cases under study but to take into account the multi-dimensional nature of the adoption environment and to identify and understand the nature of the relationship between variables involved. As can be seen from the cross-case analysis sections above, the findings reveal the substantial interplay between the various Scott and intermediary variables, demonstrating the interdependent and reciprocal relationship of the regulative, normative and cultural-cognitive dimensions.
Figure 19 presents an overview of the institutional interplay derived from the findings of the cross-case analysis. The illustration attempts to elicit this interplay of each institutional dimension, in relation to each other and to the wider system, organisational and technological factors. The study of the interplay was particularly interesting to investigate in the light of the cases within the same NHS system to understand the relationship between organisational behaviour and its wider endogenous and exogenous institutional set-up. This interest derived from the assumption in the literature that organisations which operate within the same organisational field and system tend to show remarkable similarities in organisational forms (Scott, 2008).

Figure 19: Relationship and Interplay of three institutional Dimensions
The figure further highlights the relationship of the wider system, organisational and technological factors with individual institutional dimensions. The three institutional dimensions demonstrate strong reinforcing mechanisms through being institutionalized over space and time and continuously reproduced and reinforced within a self-activating social process. The relationship between the variables are significant in determining the explanatory power and impact of each variable on the organizational behaviour in turn. In the light of the cases under study, we can distinguish between two broad institutional set-ups. The Scottish NHS cases revealed a more integrated and collaborative system, with multiple internal and external ties and networks, exerting more ‘unified’ characteristics of strong shared identities through interaction and collective sense-making. While the English NHS cases represent a more decentralized and competitive institutional set-up of more isolated and independent organisations with little communication and segregated identities. One need to therefore take into account that institutional systems are not wholly unified or coherent, indicating complex and inconsistent external and internal environments according to which organisational responses and institutional variables can vary. Understanding these connections will help to shine light on the reasons why some structures of practices have been adopted in some cases but not by others in similar circumstances.

8.2.1 Explanatory power and interplay: the regulative dimension

The regulative variable presents the most stable and fixed institutional dimension, in which behaviour of organisations is influenced through constraining, imposing and manipulation. The use of regulation played a role in attempting to change current and future behaviour of organisations through introducing specific incentives, regulative frameworks and even direct intervention which reflect the interest of the state. An example can be seen in the efficiency frameworks in the Scottish and English NHS, seeking to influence the use of resources and management of healthcare services. However the regulative dimension cannot always stand alone and often requires enforcement mechanisms to ensure conformity. While this can be achieved through regulative rewards (financial incentives) or punishment (sanctions), rules typically work within a social system and are subject to wider interpretation and acceptance by actors to whom the rules apply. The latter reflects the importance of other institutional dimensions as a gateway for disseminating, enforcing and complementing regulative forces.

Furthermore, the cases show the particular importance of the role of normative and cultural-cognitive elements in supporting the effect of the regulatory dimension. This interplay explains the observed differences between England and Scotland, not only within
cases. For example normative elements incorporate peer pressures, social sanctioning, and authority systems while the cultural-cognitive elements involve processes of collective sense-making and continuous forming and reinventing of identities within organisations. This was particularly true for the two institutional systems under study, as the more collaborative Scottish system and the deregulated English NHS system prove to rely on the effect of normative and cultural cognitive dimensions in enforcing and sustaining policy agendas through institutionalisation. Cases within one institutional framework (the Scottish or the English NHS system) therefore reflect similarities in the types of regulative and normative pressures which shape and define the underlying institutional logic and organisational behaviour. This in turn reflects the cultural-cognitive influence of collective sense-making and interpretations among participants within the same institutional framework, influenced by the level of interaction and integration of individuals and organisations.

Both institutional systems prove that the relationship between variables on the regulative and normative dimensions was particularly mutually reinforcing in not only the development of norms and belief systems but also the reciprocally underpinning regulations through normative authority and pressures. The influence of other institutional elements, such as organisation size, population need or historical development therefore further highlights the time- and context-dependent nature of the explanatory power of the regulative dimension. The effect of the regulatory dimension on the adoption of innovation can be either, direct through mechanisms of austerity and top-down mandates, or indirect through challenging, reinforcing and being reinforced by normative processes of authority and enforcement or cultural-cognitive elements of collective-sense making.

It is therefore plausible to argue that in collaborative systems and networks (as in the Scottish system) regulative structures may be reinforced both through direct state control and intervention and indirectly through collective identities and through facilitating processes of imitation. This in turn leads to more conformity to rules at local organisations due to the highly internalised system wide norms and values, which are continuously reinforced through interaction and potential social pressure, i.e. in the form of affecting relationships. More competitive institutional set-ups as perceived in the English NHS system demonstrated more independent organisations with limited exposure to collaboration, relying merely on the use of normative instruments and pressures to indirectly induce conformity at local organisations. However it is plausible to argue that organisations are less likely to comply to rules in the absence of a strong normative authority system derived through collective reinforcement and adaptation. This was particularly demonstrated in the Robotic case in England, as the hospital was not adhering to the regulative pressure for complying with the national cancer guidance, which led to
pursuing the adoption against the Government recommendations. Hence the effect of the regulative dimension is dependent on the use of authority systems in reinforcing laws and policies, as well as the process of institutionalisation into normative and cognitive behaviours.

8.2.2 Explanatory power and interplay: the normative dimension

The normative dimension proved to have an important effect on the local adoption behaviour, not only in acting as a support and enabler of the regulative dimension, but also through guiding, enabling and influencing actions and behaviours. Through defining the social rules, roles and responsibilities within a system, the normative dimension plays a strong role in guiding and enabling organisation behaviour. However, normative variables can be equally act as a constraint to local behaviour through imposing normative authority and pressures such as social sanctioning. This dimension therefore provides prescriptions and expectations of social behaviour, which in turn influences the adoption behaviour of organisations. The following section elicits the explanatory power and institutional interplay of normative variables in the form of legitimising, hindering, and reinforcing local adoption behaviour.

As can be taken from the discussion of the regulatory dimension above, the normative dimension was particularly central to conveying, sustaining, and reinforcing regulative variables and reinforce the link to individual and organisational identities and roles. However, norms and values can equally be in conflict with the regulative dimension in times of change and disruption of social order. An example of this conflict can be seen in the introduction of efficiency targets in the English NHS system in the hope to change NHS spending behaviour, leading to a clash of regulatory expectations and the values and norms of healthcare professionals. The normative pressures of competition and financial risk aversion has therefore affected local priority structures and creating silos of interest between managerial ideas of cost-saving and clinical perspectives of achieving clinical excellence. The Scottish cases in contrast reflect the normative influence in the form of peer pressures in acting on behalf of the wider NHS system, reducing individuality of actions and alignment of priorities and goals to achieve more congruency in perspectives and healthcare provision. The normative dimension therefore exerted significant explanatory power of the alignment of goals and objectives in the adoption process. For this reason the effect of the normative dimension on regulatory factors is threefold: first through reinforcing the regulative factors through processes of legitimisation, secondly acting as a potential barrier to the regulatory power in the case of conflict between regulatory expectations and existing normative paradigm, and thirdly, inter-dependent due to the time-dependent nature of social change in transforming the conceptualisation
The explanatory power of the normative dimension can be argued to be dependent on the level of interaction and collective enforcement within a system. Organisations operating in the English NHS, i.e. an institutional frameworks which exhibit little collaborative interaction tend to show more differentiated normative systems and segregated identity structures due to reduced power of collective sense-making and reinforcement of normative structures. On the other hand, the cases in the Scottish system with its strong norms of collaboration and integration, demonstrate more congruency in goals and social roles of individuals within organisations. The cases particularly reflect high levels of stakeholder engagement through networks and collaboration across vertical and horizontal organisations. In turn, the Scottish system represents a more participatory model of institutions, driving adaptation and mimetic behaviours in achieving a common goal.

The English NHS system on the other hand drives strong normative ideas of competition and benchmarking through the regulative pressures of a free market and patient choice. The internalised notion of competition reflects more resistance towards collaboration, significantly reducing the likelihood of adaptation and integration of local structures. Institutional systems incentivising for competition therefore can on the one hand have a negative impact on innovation adoption, by increasing the risk of resistance due to clashes in priorities between different decision-making stakeholders and organisations. Lack of cross-regional collaboration can further mean reduced share of knowledge and information, leading to potentially ineffective use of wider NHS resources and less-well informed adoption decisions. On the other, competition creates more autonomous local organisations independent from wider normative pressures, which leads to potentially faster local adoption decisions. The normative dimension therefore clearly influences and reinforces the cultural-cognitive dimension of self-identities, subject to social interactions and expectations which guide and constitute social conceptions of identities and behaviour. The authoritative element of normative institutions proved particularly effective in more integrated and participatory systems of institutions as they were collectively reinforced over time and space.

8.2.3 Explanatory power and interplay: the cultural-cognitive dimension

The final, cultural-cognitive institutional dimension represents the strongest context- and path-dependent dimension with most resistance to change. Cultural-cognitive variables are shaped by actor's interpretations and collective sense-making of the external environment, constituting individual and collective representations of the world. An example of such collective shaping of identities is the strong sense of belonging and
identity of an NHS Scotland family, which developed through decades in the fight for a national identity. Hence, cultural cognitive identities can be collectively shaped, defined and fought out over time. Furthermore, the highly context dependent nature of this dimension signifies the strong relationship with the wider regulative and normative factors, which influence and are influenced by the processes of collective interpretations and formation of identities.

Therefore the cultural-cognitive identities prove particularly powerful in influencing innovation adoption processes through acting as a filter to regulative and normative variables. While the regulatory dimension came across as the most prominent variables in the cases, individual and organisational identities were particular important in shaping and influencing the way other variables are enacted. For example the fight for a national identity as represented in the Scottish NHS cases has been conducive to driving norms of collaboration and equity and therefore is not a merely reactive dimension but possesses significant explanatory power in shaping the other dimensions and hence adoption behaviour. In turn, the Scottish system represents continuous reinforcement and social reproduction of a shared organisational identity of the 'Scottish NHS family' in the cultural-cognitive domain.

While the latter presents an alignment of institutional factors, cultural-cognitive variables can also stand in conflict with regulative and normative dimensions. An example of such conflict can be seen in the English NHS cases where a clash exists between regulative priorities of efficiency and financial-dominating norms and the traditional NHS culture of benevolence in fostering norms of equity and free access to healthcare for everyone. Hence the organisational identity can be challenged by changes in the external environment such as the variable nature of political seats in England, introducing new regulative agendas and normative impositions with the attempt to drive cultural change. In turn, conflicting institutional norms can lead to the development of multiple collective identities between groups, which in the case of the English NHS became segregated between financial/managerial and clinical professional groups. The normative variables therefore further played a strong role in shaping, sustaining, and developing cultural-cognitive identities within organisations. Hence, identities are highly interdependent with the normative paradigm presented within each institutional system.

8.2.4 Conclusion

The three institutional dimensions therefore demonstrate strong reinforcing mechanisms, which through processes of institutionalisation over space and time are continuously reproduced and enforced within a self-activating social process. For example regulations
can be perceived as an ‘irritant’ to social actions, yet its impact and interpretation is
dependent on the relationship between all three variables and external intermediary
factors. With this in mind, the cultural-cognitive variable proved to be the most prominent
dimension in shaping and maintaining other variables through space and time, by
determining the success and longevity of the regulatory features, while playing a role in
sustaining and reinforcing the normative features through processes of mimetics and
collective sense-making. The normative came across as the second most important
variable in sustaining institutional set-ups, in which interaction and behaviour is enabled
or constrained through legitimisation, sanctions or peer pressure. Finally, the regulative
dimension was perceived as the most ‘tangible’ yet ‘weakest’ dimension in its ability to
influence behavior, and is greatly dependent on the level of normative pressure and
facilitating culture. As regards the normative and cultural-cognitive dimensions, the
legitimisation of norms and maintenance of cultural paradigms is dependent on the
prevalence of certain forms and practices. Hence, a number of factors come into play,
such as the proximity and availability networks of organisations or requirements of
the local populations and hence the wider acceptance and institutionalisation of a certain
normative or cultural cognitive feature. This therefore explains the highly internalised
identity in the Scottish cases through high stakeholder engagement and collaboration,
which derived from repetitively communicating a shared purpose and identity.
Furthermore, the Scottish system is characterised by more integration and trust
relationships within a system of multiple ties and networks, which significantly increases
the power of collective sense-making. Hence, the more collaborative and collective
institutions as seen in the Scottish cases reveal stronger cultural-cognitive identities
through increased reinforcement and high levels of interactions. More isolated and
independent components within an institutional systems such as the English NHS
demonstrated multiple identities among a number of different stakeholders. For this
reason, the relationships between individuals or organisations are built on long-term
connections and trust, as a means to overcome the challenges of competing regulatory
and normative forces which challenge existing identities.
Chapter 9: Discussion and Conclusion

9.1 Review of key contributions

This study offers a number of important contributions to the literature, theory and practice by addressing the two main research questions:

1. **What are the different types of institutional features which impact on the adoption of innovation technologies?**

2. **How do different types of institutional arrangements affect the willingness and ability of organisations to adopt innovation technologies?**

In doing so, this research specifically sought to address the need for more contextualised and empirical research on innovation adoption in the public sector through the use of multiple case studies of one of the biggest and most complex public sector organisations, the NHS. This approach was further enriched with a multi-dimensional institutional perspective to the study of innovation adoption through Scott’s institutional framework. The institutional perspective in particular has helped to close the gap between innovation adoption and public procurement of innovation literature by exploring the underlying ‘predispositions’ to innovation adoption according to identified external and internal institutional contexts. Hence, the research provided an opportunity to theoretically and empirically explore, operationalise and apply not only the role of institutions in relation to PPI, but also the proposed institutional framework by Robert Scott. The analysis allowed us to link the three institutional dimensions of the regulative, normative and cultural-cognitive as a means to establish a more holistic perspective to innovation adoption and PPI. In doing so, the framework facilitated the analysis of the wider extra-organisational context and intra-organisational differentiation to discern complementing and/or tensions both, between the organisation and their environment, and within an organisation. Hence this research helped to inform and test the operationalisability and interplay of the various dimensions and variables across multiple institutional levels. The aim of the following sections is to review the key research findings in the light of the literature, followed by a concise representation of the key contributions this thesis offers to theory, policy and practice. Finally this chapter concludes with a review of limitations and suggestions for further research.
9.2 Contributions to institutions and adoption literature

9.2.1 The institutional context and the adoption of innovation

The key factors and mechanisms that influence whether an innovation is adopted or not, was still found to be inconsistent and insufficiently explained in the literature (Nelson et al., 2004; Wolfe, 1994). Institutions, while primarily constituted by internal actors and their interactions, were believed to determine innovation performance (Nelson and Rosenberg, 1993). The importance to empirically fill the lack of context-specific research was frequently highlighted in the literature as a means to understand the highly diverse nature of innovation adoption processes (Carl fjord et al., 2010; Barlow et al., 2006; Robert et al., 2009). This research therefore sought to provide a deeper understanding of the role institutions and their explanatory importance in mediating change and innovation.

This study has confirmed the importance of institutions and institutional environments, illustrating how internal attitudes, capabilities and organisational responses to innovation are shaped by the regulatory, normative and cognitive elements and interplay of the external and internal institutional set-up. To understand the effectiveness of innovation adoption and procurement practice, the study of the regulatory or formal institutional environment can therefore not stand alone, since the interpretation and level of compliance to formal or informal rules and related actions is dependent on wider normative and cultural elements within and outside the organisation. The interrelated nature of both innovation adoption and procurement processes within the institutional context was evident, and determined an organisation’s ability and willingness to identify, pursue and invest in new technologies. For example, procurement practice lies beyond the internal capabilities of the responsible procurement departments and is influenced by the wider levels of vertical and horizontal interaction within and beyond organisations, accountability structures and level of internal and external alignment of priorities and targets. This research reinforces the view that a single-level of analysis on institutional environments, of either formal institutions or organisational factors, is insufficient to explain the underlying mechanisms that drive such behaviours. While there are no single best practices in terms of organisation and many models can support innovative procurement, it is important to take into account the multi-dimensional nature of the adoption environment of external and internal institutional factors to understand the dynamics of actor roles and behaviours in the process. This research addressed this gap between innovation, procurement and institutions, by exploring the adoption behaviour and interactions of stakeholders in the context of the NHS system, as a large and highly complex public organisation. This research therefore sought to provide a deeper understanding of the role institutions and their explanatory importance in mediating
change and innovation.

9.2.2 Institutional interplay and actor behaviour

This study has adopted a multi-dimensional institutional lens to the study of innovation, mobilising a rich set of exogenous and endogenous institutional variables against the three dimensions of Scott’s institutional framework. While the interplay of the three dimensions is apparent, this study further highlights the importance of analysing the interaction of variables across organisation and system level. The variables range from the formal and ‘given’ rules seeking to influence local conduct, towards more ‘softer’ variables of the normative and more unconscious and culturally defined cultural-cognitive variables.

While the regulatory is known to set ‘the rules of the game’ (North, 1990), their application and effectiveness is influenced by the conducive interplay with the normative and cognitive-cultural dimensions. The normative variable especially proved to be an important determinant of how organisations behave according to wider norms and interpretation of regulatory frameworks. An example here is the level of interactions and compliance to duties or rules observed. The cultural-cognitive variable proved to be the ‘softest’ and most difficult variable to grasp of the institutional dimensions, which played a particular role in how individuals within a system and organisation interpret their environment, specifically determining individual identities and roles. Typical characteristics identified here were the level of imitative behaviour and ‘feeling of belonging’ as part of the self-identities, which proved to contribute for example to this the normative level of compliance and interaction within and across the organisation and could further signify an explanatory factor of diffusion. The importance of the institutional context especially in relation to wider cultural elements was highlighted in determining policy implementation to improve innovation processes.

Furthermore, the institutional interplay needs to be examined across multiple institutional levels to understand variations in adoption behaviour. As highlighted in the PPI literature, despite the high level of political intent in shaping and improving policy instruments, PPI was still perceived as failing to meet its full potential in driving innovation (Edler et al, 2015). Hence the relationship of regulatory, normative and cultural-cognitive elements across wider organisation and system level has proved to play an important role in explaining adoption behaviour. This study therefore emphasises the importance of this interplay of variables and dimensions, due to the effect in supporting and reinforcing each other. The combination of institutional literature with the study of innovation adoption and
PPI therefore proved highly beneficial in this thesis, not only in explaining adoption performance in relation to the role of actors, but also to establish framework conditions that help to understand associated capabilities and behaviours of actors.

9.3 Research Contributions

9.3.1 Theoretical and conceptual contributions

This study offers a number of important theoretical contributions to two main strands of literature, which are the institutional theory literature and literature on PPI. The contributions to both literature strands are conceptual, addressing the lack of systemic and consistent theory development for innovation adoption in the policy literature and lack of a comprehensive analytical framework for the study of contextual factors for organization behavior. Provided the limited understanding of the impact of different institutional dimensions on innovation adoption available, this work provides a more holistic and multi-dimensional perspective to the study of innovation adoption, from which a number of theoretical implications can be drawn.

The originality of combining Scott’s framework with the multi-dimensional analysis of wider exogenous and endogenous factors was to respond to the lack of consistency in institutional theories and perspectives, representing conflicting, yet often overlapping, multiple levels of institutional realities by different scholars. This research sought to capture the variety of institutional perspectives within one single comprehensive framework as a means to establish a more thorough and contextualised understanding of organisational behaviour (Scott, 1995). While Scott’s institutional framework has become one of the most-cited contributions in the institutional literature, the framework yet lacks satisfactory operationalization and application of the three pillars (Mizruchi and Fein, 1999; Kostova and Roth, 2002; Greenwood et al., 2008). Hence the theoretical contributions of this paper is twofold: first, due to the merely conceptual basis of Scott’s institutional variables, this research presents one of the first major effort to empirically explore and operationalise the three pillars through the study of multiple adoption case studies. As emphasised in the literature, the topic still lacks a systematic understanding of the relative importance of each pillar and interdependency of factors (Edquist and Hommen, 1999; Scott, 1995). Particularly, most research merely focused on individual level analysis, failing to acknowledge the impact of different institutional settings on individual behaviour (Glenn et al., 2010). This leads us to the second contribution, the application of a multi-level perspective of external and internal factors has presented a more holistic analysis of innovation adoption behavior. This research therefore provides a more comprehensive
understanding of adoption behavior by going beyond the study of pure organizational capabilities and processes and investigating the impact and relationship between both, the organization and contextual factors and institutional factors within an organisation. This research has therefore primarily contributed in furthering a more holistic understanding of innovation processes through applying a multi-level and multi-dimensional analysis and institutional perspective to the study of innovation adoption and PPI.

9.3.2 Empirical and practical contributions to public sector organisations

Beyond its theoretical and conceptual contributions, this study holds further important empirical insights and implications for practice on the management of adoption processes in public health organisations. Most empirical research on innovation adoption in the NHS up to date focused on the study of individual level analysis of adoption teams, individuals and organisational factors, failing to acknowledge how different organisational settings and contextual issues moderate the decision-making and adoption behaviour of organisations (Robert et al., 2010). In particular, having empirically explored the three institutional dimensions in the light of two different exogenous institutional contexts, the findings of this research shine light on the key features which play a role in facilitating a more innovation-friendly organisational environment. This section therefore synthesises the underlying framework conditions and contextual factors under which each feature comes to play. Due to the international importance of the NHS and global challenge of innovation adoption in public organisations, this study may further hold important implications for other large, multi-level and complex organisational settings, particularly public organisations. This research particularly emphasized the importance of understanding the relationship between the internal and external institutional set-up, taking into account the influence of regulatory, normative and cultural-cognitive factors and interaction of those factors that determine organization behaviour. For example, regulations may have an incentivising nature for changing and influencing behaviour over time and space as can be seen through the ‘Hospital Associated Infections’ (HAIs) Campaign, seeking to induce a culture of hygiene to change long-term behaviour in hospitals. While another example could be the importance of historical factors of a labour dominance in Scotland, which explains the ongoing culture of independence from England and sense-of belonging and integration. Three main empirical insights can be identified from the analysis, emphasizing the importance of organisational ethos/identity, roles and responsibilities, and stakeholder involvement.

1. Strengthen the level of alignment of targets and culture across national, regional and local organisations to facilitate a more integrated
organizational identity and reduce the existence of contrasting financial and clinical perspectives.

Previous research studying the relationship between organisational culture and innovation adoption emphasised the importance of organisational identities and ethos in contributing to the different organisational responses to innovation adoption (Jakobs, 1989). Due to the collective nature of decision making processes for innovation, the level of integration between national and organisational identity proved to have a particular impact on the level of commitment and motivation for innovation adoption (Hammerlander et al. 2012). While the cases in this study confirm the importance of culture and ethos, the findings further shine light on the underlying framework conditions which are conducive to creating an innovation-favourable organisation culture. The findings show that more integrated vertical and horizontal authority structures across national and local organisations are more likely to hold a shared and uniform organisational identity. This was especially true for the cases in the Scottish NHS system where the national identity of a ‘national Scotland family’ prevails, based on a strong ethos for national independence and cross- organisational and regional collaboration. Organisations and individuals in the Scottish cases therefore demonstrate a strong sense of ownership and belonging to the Scottish NHS system, driving a shared interest and passion in acting on behalf of the wider NHS. This shared identity has a particular positive impact on innovation adoption processes, as individuals develop an intrinsic motivation to pursue innovation for the greater good of the organisation and NHS system. The Scottish cases demonstrate an example of the influential power of national cause in driving a more uniform organisational identity and in turn influencing the overall local receptiveness to new technologies (Hoholm and Stronen, 2011). While this is mainly facilitated by strong central leadership and ‘can-do’ attitude, the predisposition of local adoption strategies are especially reinforced by high levels of mimetic behaviour and normative peer pressure across organisations and individuals.

However, within organisational frameworks which incentivise for intra-organisational competition, local organisations experience a clash in managerial and clinical professional perspectives, leading to a lack of common organisational ethos to innovation adoption. One could argue that competition can be a driver of innovation, where professionals within organisations are motivated by a mind-set of elitism and rivalry as a means to attract and retain patients and professionals through innovation. Innovation adoption therefore presents a strategic incentive to organisations through conveying a forward-thinking and modern organisational image to the outside, which in turn reinforces an innovation-oriented identity of key individuals within the organisation. However, the dominance of managerial and financial culture imposed through the strict austerity agenda has in turn proven to influence priorities towards more short-term perspectives of fast returns verus long-term
savings and clinical improvements. With overtones of a financial ethos at managerial levels, the professional drive for improvement and innovation on the clinical side often conflicts with the managerial priorities of cost-reduction and efficiency. The findings therefore demonstrate conflicting competitive undertones of (1) financial driven competition among managerial levels and (2) innovation driven competition at professional/clinical levels. The lack of a strong organisational ethos and identity therefore acts as a barrier to congruent decision-making and formulation of unified perspectives in adoption strategies. Institutional set-ups influenced by conflicting identities and priorities, as the English NHS cases demonstrate, therefore would benefit from strengthened national or regional roles and stronger communication links as a means to align the multiple priorities. With the highly decentralised governance system and independent nature of English health organisations, the central influence in directing or mandating change in local organisations is significantly reduced in comparison to the Scottish NHS counterpart. With the multiple external regulatory bodies, such as NICE, the new Clinical Commissioning Groups, the Supply Chain and Monitor to mention a few, responsible for regulating, inspecting and guiding local organisations, the accountability lines to government are relatively weak. For this reason, one possible action to achieve more integrated priorities is to increase the collaboration between the Department of Health and the external bodies as a means to align financial and clinical objectives and achieve a more consistent priority structure across the NHS system. For example, NICE played an important role in informing health organisations on possible benefits of new technologies, however failed to demonstrate the financial benefit of adoption, clashing with managerial and financial priorities. On the other hand, Clinical Commissioning Groups proved to have significant influential power and credibility in informing and communicating strategic and financial benefits of new technologies to local health organisations. However, the uncertainty in achieving changes in tariff rates has posed another risk to the adoption and implementation of innovation. Hence, increased collaboration at regulatory level for more effective alignment of goals and priorities may present a good example of how to prevent clashes in local incentive structures for more integrated decision-making.

2. **Establish a team approach or clear leadership/facilitator roles to support ideas of adoption within an organization through the highly bureaucratic and multi-professional healthcare environment.**

Furthermore, the overall organisation authority structure proved to have a significant impact on the ability to adopt innovation, often referred to in empirical literature as ‘centralised’ and ‘decentralised’ authority structures (Baldridge and Burnham, 1975). Former research already emphasised the importance of authority positions and power relationships as a determinant of communication links and legitimisation of innovation.
adoption decisions (ibid., 1975). Yet the cases proved a wider number of factors to be significant in leveraging the level of internal and external communication of an organisation. The findings in this research particularly emphasise the importance of integration and coordination of perspectives to achieve collective value and belief system across the different stakeholders within the organisation. Previous research has described more centralised and integrated organisational structures to be typically linked with driving mostly efficiency and cost reduction in adoption decisions, rather than innovation (Kimberly and Evanisko, 1981). However, this research proves that a degree of central coordination, in the form of leadership or facilitator roles, can in effect serve as a driver for innovation adoption, particularly in linking the diverse and often contrasting perspectives together. Collectivity and integrated value systems therefore lead to more evenly distributed levels of autonomy in decision-making, reflecting notions of mutual respect of individual roles and hierarchical position. While the latter may lead to smoother and potentially more informed and wide-spread adoption, collective organisational systems can on the other hand slow decision-making processes due to more iterative nature of communication links.

Especially in multi-stakeholder and professional environment of healthcare organizations, the existence of different professional identities, skill sets and cognitive frames of individuals and groups, argued to play an important role in innovation adoption (Robert et al., 2010). The analysis of cases highlight the dynamic nature of professional roles, skills and perceptions to be shaped over time by various organisational and contextual factors, beyond formal job descriptions and regulatory guidance. The findings particularly show how normative and cultural-cognitive factors such as expectations, values and self-perception of individual’s roles play an important part in how professional behaviours and relations between them unfold in decision-making processes. In highly integrated organisational frameworks, such as the Scottish NHS cases, individuals within adoption processes are more likely to hold a shared vision and highly interconnected priority structure, which links the different parts of the decision-making process together. However, due to the highly bureaucratic nature of the Scottish system of multiple decision-making layers at local, regional and national level, decision-making processes were often perceived as slow and iterative, which significantly delayed the adoption of innovation. For this reason, cases which demonstrated strong local leadership or mediation roles who link the variety of professional groups and decision-making levels together, proved to achieve more efficient decision-making processes. Especially with the high variation of professional backgrounds and disciplines in hospitals – ranging from management, operations and clinical roles – the reinforcement of a common vision is especially important in achieving a more uniform value system. This proved to help combat potential conflicts between different professional groups through the alignment of a common goal and a joint understanding of the wider organisational need.
This holds particularly true for decentralised authority structures, which are often characterised by a lack of formal power relationships and integrated value system. At the same time, this kind of de-centralised structure allows for more self-autonomous individuals and organisations, with the potential to overcome potential resistance at central or other organisational levels. In such instances, organisations may benefit from strengthened roles of leadership such as clinical champions or innovation-specific roles to support and ‘push’ innovation ideas through potential resistance experienced at the various decision-making stages. Facilitator therefore played an important role in overcoming differences in priorities and perspectives on innovation adoption between managers and clinicians. In situations of resistance the cases equally demonstrated the strength of personal relationships between individuals within an organisation to further help overcoming clashes between different adoption perspectives. The latter particularly confirms the different levels of autonomy clinicians can achieve in decentralised organisation structures, in bypassing formal decision-making routes. This can be achieved through directly influencing managerial or executive perspectives, through either clinical championship or personal relationships with central decision makers of high decision-making authority.

3. Introduce incentives to improve communication with stakeholders within and external to the adopting organization, through establishing transparent decision-making processes that encourage stakeholder participation

The role of communication in innovation adoption processes was exceedingly emphasised in the literature as an important element for more informed decision-making and knowledge flow (Robert et al., 2010). As highlighted by Fitzgerald et al (2002) the healthcare context is characterised by multiple stakeholders and decision-making ‘points’, in which greater emphasis needs to be placed on the interactions inside and outside the organisation. This study found that strong levels of communication proved important for more holistic and well-informed adoption processes in the cases. The cases showed that level of and impact on communication on adoption outcomes was found to be dependent on a number of contextual factors that need to be taken into account. For example, in more integrated and collective institutional systems like the Scottish NHS cases, the ability to communicate and engage in collaborative activities across and within organisations was perceived as high. The cases demonstrated how collective or ‘unified’ institutional structures can achieve more transparent and well-informed adoption through involving a number of different stakeholders, groups and networks in the decision-making process. This confirms the importance of external stakeholder integration for the exchange of evidence, good practice, and more effective decision-making (Kimberly and Evanisko,
Especially in combination with government leadership and collective belief system conducive to innovation, cross-organisational communication was proven to have a positive impact on decision-making in across a wider number of stakeholders. However, the cases also showed that the involvement of multiple stakeholders causes delays in decision-making due to various feedback loops and perspectives to be considered.

In contrast, the analysis of more deregulated institutional system of the English cases demonstrated how incentives for inter-organisational competition significantly constrained the decision-making capacity of organisations due to a lack of information and knowledge flow on innovation across the system. The notion of competition particularly created a lack of trust between organisations and stakeholders in sharing information or experience due to the perceived fear of ‘falling behind’ and competitive rivalry. Competition therefore signifies a barrier to cross-organisational communication, reducing the role of networks, technology trials and lead adopters as information sources, shifting the responsibility of adoption to the local organisations. On another note, competition was considered to be positive factor for innovation adoption, exactly due to the underlying pressure of rivalry in driving competitive benchmarking activities in competing for patient services (Utterback, 1974). To improve cross-organisational communication, organisations might benefit from an external mediating role or opinion leader on a regional level to artificially create the flow of information against the perceived competition. This role may be considered by the regional Clinical Commissioning Groups due to their established regulative power in assessing and allocating healthcare services to local health providers, considered as a credible source of information to local organisations. Hence, taking these factors into account, the level of communication in adoption processes played a significant role in not only the share of information but also the speed and comprehensiveness of adoption decisions.

### 9.4 Implications for policy and practice

This research further entails important implications for policy and practice in supporting and better managing public organisations, drawing on the importance and interplay between the multiple institutional dimensions. As emphasised by recent policy research in the EU, the study of individual actors and their environment has received increasing attention for the development of more innovation-friendly regulatory frameworks (European Commission, 2002). However, the relationship between the institutional context and actor behaviour still requires further empirical attention to widen the underlying organisational conditions that determine the willingness and ability to adopt innovation (Mytelka and Smith, 2002). The contributions in this section can therefore be divided into
two main parts: The first section is concerned with how broader and more effective framework conditions can potentially support innovation and lead to improved uptake of PPI. The second section will then elicit in more detail the underlying institutional factors which can contribute to strengthening capabilities of actors and organisations in relation to procurement and adoption of innovation.

9.4.1 Creating broader institutional framework conditions and supporting organisations

Effective policy making needs a sound understanding of the “policy problem” (Borrás and Edquist 2013), including a comprehensive understanding of wider contextual factors which affect, shape and influence the effectiveness of innovation policy. With this in mind, this section presents two major policy implications referring to 1) the level of vertical and horizontal coordination of variables across multiple institutional dimensions and 2) the role of governance, leadership and alignment of national, regional and local priorities, which will be elaborated in the following. Finally, implications for practice are then presented in ‘section 9.4.2 Implications for practice: Strengthening actor capabilities and influencing demand’.

1 Implement tools to improve communication between national, regional and local targets for PPI, as a means to achieve more aligned strategic and performance objectives in balancing potential benefits of innovations against achieving value for money.

Due to the context-bound nature of technological change and adoption processes, the literature has highlighted the importance of coordinating and aligning different institutional dimensions in the creation of more favourable innovation culture at local organisations (Borrás, 2004; Georghiou et al, 2015; Valovirta, 2015). This research particularly emphasises the importance of cooperation and coordination of external and internal perspectives for improving the alignment of targets and culture across national and local organisations. Effective coordination between different institutional level has been argued to be subject to the level of central leadership, incentive systems and enforcement mechanisms which play a role in shaping the priorities and interactions of individuals and organisations.

Local health organisations which operate in more deregulated organisational systems (as perceived in the English NHS) proved to be more independent from regulatory frameworks, leading to a clash priorities within and across organisations on the adoption of new technologies. These clashes particularly occur between different professions (Clinical and
managerial) and different decision-making levels across local, regional and national scales. Hence, the process of alignment requires significant support and planning on risk and target assessments in the form of action plans or guidelines. This is particularly the case in more deregulated national authority frameworks, due to more distributed autonomy structures which in line with incentives of competition lead to higher levels of independence and differentiation among local organisations.

On the other hand, more collaborative national frameworks, as perceived in the Scottish NHS cases, the level of central and regulative direction has a stronger impact on local organisation behaviours. Hence, differences in the national framework can have varying effects on the responses and behaviours of procuring public organisations, signifying the importance of policy-makers to fully acknowledge subtle institutional differences as a determinant of success or failure of innovation procurement policy (Rolfstam, 2008). Collective institutional frameworks prove to offer more favourable conditions for the dissemination of knowledge across stakeholders and networks, which may increase the likeliness of innovation adoption across a wider number of organisations. This can be explained due to the strong vertical accountability structures to government and normative peer pressure to behave in the line with the national priorities and ethos, leading to higher levels of compliance as well as mimetic behaviour of organisations.

2 Develop tools to improve coordination and strategic alignment of national, regional and local targets and develop systematic procurement procedures to reduce duplication and ineffective use of resources across a system or organization to achieve greater value for money.

The literature highlighted the potential of central government in linking the various government and organisational stakeholders together as a means to influence, reinforce or improve the adoption context in which organisations operate (Edquist and Zabala-Iturriagagoitia). The influential role of government (or lack thereof) proved particularly significant in driving a national strategy and vision across the multiple stakeholders within a system. Clearly, more collaborative institutional systems such as the Scottish NHS cases, benefit from more integrated and strengthened roles of authoritative bodies, such as the Managed Care Networks and National Planning Forum in Scotland. In contrast, the more deregulated institutional framework of the English NHS system lacks the power of central government in not only intervening but also strengthening co-regulatory bodies such as NICE and Clinical Commissioning Boards in influencing local adoption behaviour. Hence the role of government leadership plays a role in coordinating the multiple types of organisations and stakeholders towards a common goal, as observed in the more integrated Scottish NHS system.
Following from this, the strong coordinating power of central government in dictating and planning regional and local health services has further received increasing interest in driving centralised procurement activities on behalf of local organisations. While centralised procurement activities have been traditionally regarded as driving mainly efficiency and cost reduction, the cases in this study prove its potential to drive nation-wide innovation adoption (Caldwell et al, 2005; Valorvirta, 2015; Dalpe 1994). Especially in relation to the integrated Scottish NHS system, the cases show that centralisation of procurement activities could potentially be used to drive system-wide and consistent adoption across the country. In combination with a strong national ethos and norms of equity and consistent case, catalytic innovation procurement can significantly improve problems of duplication and combat the inefficient use of the new technologies adopted. Furthermore, on a regional scale, organisations may be incentivise to engage in partnerships or joint procurement contracts to collaborate on the use and purchase of large medical devices and patient demand where possible. Introducing more regional purchasing activities may allow to alleviate the problem of competition and reduce post-code lotteries in adoption.

9.4.2 Implications for practice: Strengthening actor capabilities and influencing demand

Furthermore, this study calls for good attention to the relationship between the wider institutional set-up and the nature of interactions and capabilities of organisations for innovation adoption processes. The level of cooperation and communication in fostering open dialogue and interactive learning between important stakeholders in the decision-making process (users, procurer, and suppliers) has been repeatedly emphasised as significant determinants of successful procurement processes (Edler et al., 2015). The benefit of stakeholder interaction particularly lies in facilitating more frequent and faster flow of information and integration of perspectives to not only overcome resistance but also to achieve a more holistic decision-making process. It is therefore important to understand the various contextual factors which influence the level of collaboration before further exploring the impact on innovation adoption. In this research, two areas of policy recommendations are presented: first, building procurement competencies and stakeholder interaction and secondly, improving the flexibility of procurement procedures for the adoption of innovative technologies.

1. Develop and follow a standardized procurement process that fosters transparency and effective stakeholder participation.

The literature particularly highlights the importance of inter-departmental collaboration within organisations to facilitate the exchange of ideas, knowledge and experience within
an organisation (Edquist and Zabala-Iturriagagoita, 2012). The ability to do so was deemed as particularly significant for the procurement process in effectively communicating and translating clinical needs or problems into functional specifications to the supplier. However, the findings of this research show that the level of participation of different stakeholders and decision-making levels within and outside an organization was highly dependent on the wider institutional incentive structures within which an organisations operates. For example, more ‘unified’ institutional systems incentivising for vertical and horizontal collaboration as reflected in the Scottish NHS cases, demonstrated higher levels of internal stakeholders engagement and collaboration in contrast to more deregulated institutional systems incentivising for competition (English NHS). The latter is specifically accompanied by silos of interest between financial/operational and clinical perspectives, which reduces the willingness to communicate across departments due to a lack of trust in aligning priorities. The lack of integration have particularly affected the adequate involvement of relevant stakeholders in the adoption process, particularly the procurement department.

2. To improve participation of different stakeholders across all stages of the decision-making and procurement process, the organization might develop standardized processes that foster regular and engagement in transparent dialogues between stakeholders within and outside the organization such as suppliers, patients, networks, management and end-users.

The wider national incentives for collaboration (or competition) have an important impact on the engagement of organisations with other stakeholders through regional or external networks. As highlighted in the literature the involvement of diverse networks play a particularly important role in “establishing new combinations of knowledge”, facilitating the development and share of capabilities, knowledge and experience in decision-making processes within organisations (Edquist and Zabala-Iturriagagoita, 2012). The findings confirm this specifically in relation to more integrated institutional frameworks as perceived in Scotland, which encouraged the use of diverse network groups. While more deregulated and competitive systems have shown limited engagement in cross-regional networks due to problems of competitive secrecy. Therefore, the English NHS system could benefit from more national networks based on specialty interest rather than regional collaboration basis to downplay the competitive element between geographically close organisations.

3. Introduce more flexible procurement procedures or contracts that facilitate the identification, evaluation and procurement of innovations to overcome the perception of the procurement process as an “obstacle” to innovation
adoption.

The increased engagement of internal stakeholders, especially procurement department will particularly aim to target improved knowledge and understanding of markets for a more pro-active (opposed to re-active) procurement approach. Hence, the level of procurement engagement plays an especially important role in not only communicating clinical ideas and needs to the procurement department but also in forging an effective user-producer relationship. The problem observed in the cases was particularly related to the lack of involvement of the procurement practitioners due to the perception that the procurement process is seen as a hurdle to innovation adoption. The use of more flexible procurement procedures that allow for the identification, selection and more favourable procurement of innovation technologies, might help to alleviate the opposing perception to the purchasing process. The involvement of the procurement department at an early stage is particularly importance leveraging the negotiating power vis-à-vis the supplier and coordinating an effective competitive dialogue in procurement processes. Institutional systems incentivising collaboration and strong levels of integration may signify a less attractive market for developers due to higher barriers to entry. On another note, stronger negotiating power can have a negative impact on organisations’ potential access to innovation, due to the lack of interest of suppliers to invest in R&D activities in the case of significantly reduced access to markets. For this reason, organisations may further consider strengthening the involvement and early dialogue with potential suppliers as a means to communicate needs and requirements for innovation. This in turn will allow more targeted R&D activities by suppliers in response to specific user demands and facilitate improved uptake of innovations in turn.
9.5 Limitations and suggestions for further research

9.5.1 Research limitations

Like most research, this work has a number of limitations which need to be taken into account, which can be summarised into two main points.

The key limitation of this research is related to the generalisability of the findings, owned to the qualitative case study research design applied in this study. Despite the many positive aspects of qualitative research, such as studying the phenomenon within its real live context as applied in this research, studies continue to be criticised for a lack of generalisability and objectivity. This was particularly related to the nature of small samples, rendering the generalisations of conclusions more difficult (Yin, 2004). Generalisability has been defined as the degree to which findings are generalizable beyond the sample population of the study (Maxwell, 1992). As discussed in the methodology ‘Chapter 4: Methodology & Research Design’, this research attempted to address this problem through applying a multi-case study approach, leveraging the generalisability of findings. However, one can distinguish between different types of generalisability, referring to 1) the representation of findings in correspondence to the study’s population, 1) the ability to infer and apply the findings to other settings and 3) theoretical generalisations (Lewis and Ritchie, 2003). The use of multiple case studies has contributed to better replicability of research findings, yet does not compare to the potential of quantitative statistical generalisability (Yin, 2004). The strongest type of generalisability supported in this study is the theoretical replication, through the application of a broader analysis with the help of the conceptual framework applied. The framework in particular helped to establish underlying framework conditions within which actor behaviours are manifested. On the basis of the two main research limitations established above, this study calls for potential areas for further research, which will be discussed in the subsequent section.

Secondly, due to the depth of the conceptual framework and limited timeframe of the research, some of the variables were more difficult to empirically grasp, particularly the variable carriers of “routines” and “artifacts”. The complexity of the framework and nature of institutional variables might require a more longitudinal research frame as a means to capture the multitude of factors and explore variables which may be less evident in the interviews. For this reason the use of ethnographic research would be a possible option to allow grasp the complexity of the conceptual framework and relationship of variables.

Finally, due to the limited timeframe of the cases, the findings are mainly limited to the
former English NHS structure. Therefore the cases cannot fully represent a comparison of innovation adoption behaviour in relation to the former and “new” English NHS structure. Despite this, due to the overlapping of some cases with the start of the changes, the findings present some valuable insights on how the new NHS structure may influence innovation adoption in the future.

9.5.2 Suggestions for further research

Some of the important concepts and theoretical perspectives drawn from the literature to underpin the institutional framework in this study are still empirically underdeveloped. Especially both the distinction and the operationalisation of the three institutional pillars laid out by Scott are essentially in its infancy being merely theoretically grounded. Therefore, the empirical application of this rich and complex framework has proven an ambitious and challenging task in this research, since the operationalisation of the various dimensions was relatively weakly supported in the literature. Despite this challenge, this study has attempted to mobilise and operationalise the framework within a rich data set of contextualised case studies. As one of the early applications of this framework, this study was able to strengthen the definition and delineation of the various dimensions, with particular insight given to the underlying interplay of variables within. Yet providing only an initial effort, the contribution should be considered as open-ended rather than conclusive, signalling the importance for further research in tailoring the operationalisation and distinctions of the three dimensions. Hence, based on the exploratory nature of the topic, this research offers three avenues for further research suggested in the following:

First, based on the issue of generalisability, further research could benefit from exploring the phenomenon within wider institutional contexts. This can be done in two main ways: First, new research might consider widening the scope of analysis to other sectors and organisations through empirically applying the conceptual framework in an exploratory manner. The framework particularly offers a potential platform for analysis for different institutional contexts, such as different public sectors as well as in large private organisations. This will feed into the first limitation of this research in furthering the understanding and operationalisation of the conceptual framework and encourage learning across sectors and organisations. Secondly, this study only proposed initial attempts in empirically integrating multiple levels of institutional analysis to innovation adoption and PPI, and will benefit from further application and adaptation. It is encouraged to examine the framework with larger samples as well as longer time frames which will help to further test and strengthen the replicability of findings of future research. Furthermore, the research might further benefit from a longitudinal ethnographic research design as a
means to better explore the underlying organisational behaviour in relation to the different institutional dimensions. An ethnographic research design will in particular help to further operationalise and explore the relationship between the more difficult to grasp normative and cultural-cognitive institutional dimensions.

Secondly, this study has primarily limited to the study of institutional contexts in relation to innovation adoption and PP, however the topic proves much wider in scope. Future research may consider to explore different areas of PPI research, such as exploring the role of institutions in ‘triggering’ demand-side practices to understand the conditions for better articulation of demand and how to best harness innovative capabilities of private firms. Furthermore, research on a policy-level may benefit from applying the conceptual framework in furthering the understanding of policy coordination and implementation in relation to institutional contexts and actor behaviour. In relation to innovation research, the study of instructions in relation to innovation adoption might potentially feed into how certain institutional frameworks might signify potential dissemination and diffusion of innovation. Therefore, further research may want to explore this relationship and replicate the theoretical approach in identifying the role of institutions on the study of innovation diffusion.
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Appendices

Annex 1: Invitation letter to innovation and procurement experts

Dear [name of participant],

As a doctoral research student at the Manchester Institute of Innovation Research, I am currently undertaking a research project on the adoption and procurement of innovative health technology. A major focus of this project is to understand the role of institutional features and variations in institutional set-ups in an organisation’s ability and willingness to buy and apply innovations. Broadly I am interested in exploring the different institutional perspectives in the English and Scottish NHS system as a means to identify the specific features which make a difference in the adoption process.

As the Vice Chair at the [name of organisation] and current involvement in [other relevant activities or memberships], your experience and personal perspectives on this topic would be invaluable to this research project. I would be delighted to be offered the opportunity to discuss this subject further with you.

I am able to travel and meet in person or have a telephone conversation at a convenient time. If you require further information please do not hesitate to contact me.

Best regards,

Clara

Clara Weisshaar | PhD Researcher
Manchester Business School | The University of Manchester | Room 7.03 Harold Hankins Building | Booth Street West | Manchester M15 6PB | UK
Mob +44 (0)7581537878 | Clara.Weisshaar@postgrad.mbs.ac.uk
Annex 2: Example invitation letter to case study participants

Dear [name of participant],

My name is Clara Weisshaar and I am currently working on a doctoral research project at the Manchester Institute of Innovation Research (MIoIR) Manchester Business School on the adoption of new medical devices in the NHS.

A major focus of this project is to understand the role of institutional features and variations in institutional set-ups in an organisation's ability and willingness to buy and adopt innovations. This will be done through context analysis and case studies in the Scottish and English NHS system.

I am contacting you regarding the introduction of the Holmium Laser in the NHS, which has developed as an extremely interesting case for my research. I have read a very interesting article on BBC, highlighting NHS Forth Valley to be the first NHS board in Scotland to have successfully adopted and to be using the Holmium Laser for prostate problems. This is extremely interesting and I would be very interested in learning more about your current practice and experience with this device.

As the top Consultant Urologist and key decision maker in driving the adoption of the [name of technology] at [hospital name], your personal perspectives on the topic would be extremely valuable to my research. I would like to kindly ask you whether it would be possible to have a short telephone discussion with you to hear your personal perspectives on this topic? Your input is highly valued.

As part of the wider on-going debate of the potential of public procurement to foster innovation, my work is particularly inspired by the ESRC funded research on public procurement (the UNDERPINN project) at the MIoIR, led by my supervisor Professor Jakob Edler and Professor Luke Georghiou. My work contributes to a broader programme at the institute on public sector innovation and public sector procurement projects and will offer direct input into more informed policy-making in the future. Please find attached a summary of my research objectives for your information.

If you have any questions regarding my research, please do not hesitate to contact me.

Thank you very much for any help you can give,

I look forward to hearing from you.

Kind Regards

Clara

Clara Weisshaar | PhD Researcher
Manchester Business School | The University of Manchester | Room 7.03 Harold Hankins Building | Booth Street West | Manchester M15 6PB | UK
Mob +44 (0)7581537878 | Clara.Weisshaar@postgrad.mbs.ac.uk
"Understanding the relationship between the adoption of innovation and institutions: an exploratory qualitative case study on NHS procurement"

Despite various efforts to introduce support measures and financial incentives to improve innovation in the public sector, it is widely agreed that the purchase and adoption of innovation is still perceived as a slow and complex process. We are currently undertaking a doctoral research project investigating the role of institutional features in the adoption of innovative health technologies to better understand how variations in institutional set-ups influence the organisation’s ability and willingness to buy and apply innovations. A major focus of this research is to explore this question comparing the English and Scottish NHS system in order to identify the features which can drive or hamper the adoption process.

The work is inspired by the ongoing debate of the potential of public procurement to foster innovation and the research project ‘Understanding Public Procurement of Innovation’ (UNDERPINN for short), led by MIoIR members Professor Jakob Edler and Professor Luke Georghiou. For further information, the link to the project can be found at: https://underpinn.portals.mbs.ac.uk/Home/tabid/1537/language/en-GB/Default.aspx.

This project is concerned with the problem of slow adoption and the various challenges related to the procurement and adoption processes. With this work we aim to address the following three questions:

1. How do different types of institutional arrangements influence the adoption and use of technological innovations in the NHS (England/Scotland)?
2. What are the underlying external and internal institutional structures that affect the ability and willingness of an organization to adopt innovations?
3. How does the interaction of the different structures affect the outcome of adoption efforts?

With a long history of restructuring and stringent targets on more efficient and patient oriented healthcare services in the NHS, it is widely recognised that improved innovation procurement and adoption processes will significantly contribute to achieving these targets. This research should provide valuable insights into the potential impact of different structures and help to understand the factors that play a role in the procurement and adoption of innovative health technologies. The outcomes of this work will therefore be useful for those working in the field of innovation, health technologies and procurement and will be disseminated to policy makers to contribute to more informed policy making in the future.

Contacts: Clara Weisshaar, Doctoral Research Student, Manchester Business School – Clara.Weisshaar@postgrad.mbs.ac.uk
Annex 4: Data confidentiality agreement

[Information Consent Form for name of participant] [Date]

This informed consent form is for representatives involved in innovation and procurement in the English and Scottish National Healthcare Service and who are invited to a short interview for the research project, titled “Understanding the relationship between the adoption of innovation and institutions: an exploratory qualitative case study on NHS procurement”

[Name of Principle Investigator] Miss Clara Weisshaar
[Name of Organization] Manchester Institute of Innovation Research (MIoIR), Manchester Business School
[Name of Supervisors] Sup.1: Prof. Jakob Edler; Sup.2: Dr. Sally Gee
[Name of Project and Version] Understanding the relationship between the adoption of innovation and institutions: an exploratory qualitative case study on NHS procurement

Voluntary Participation and Procedures
Your participation in this research is entirely voluntary and you may decide later if you choose to withdraw participation or refuse discussion of certain topics at any time. If you accept participation, you will be asked to take part in a conversation with myself, which will take approximately 45 minutes of your time. There will be also a possibility to get involved in further group discussions involving 5-6 other persons at a later stage of this project to discuss themes of innovative health technology adoption and institutional structures in more detail.

All discussions and personal information will be treated sensitively and with high confidentiality and will be used for the purposes of this research project only. The interviews (and subsequent group discussions) will be tape-recorded by consent of each individual member. At the end of the interview the transcript and findings will be sent to you for the review of factual accuracy and information may be edited or removed on request. All information recorded is strictly confidential and the tapes will be destroyed after the completion of the research project. In the case of publication of the research findings, the use and release of any shared information or data must be expressly authorised by the participant. For the group discussions, all participants will be asked to sign a confidentiality agreement and to not share any information outside the group.

Certificate of Consent (to be signed by participant)
I have read and understood the foregoing proposal and agree to comply with all of the above-stated information. I have had the opportunity to ask questions about the project and have been answered to my satisfaction. I consent voluntarily to take part in the interviews.

Print Name of Participant:

Signature of Research Team Member: Date (dd/mm/yyyy):

For further information or questions concerning the project, please contact Clara Weisshaar on the contact details below. This proposal has been reviewed and approved by the School and supervisory team.

Sincerely Yours,
Annex 5: Interview guide for the context analysis

Context Interviews:

Q1. Could you tell me a little bit about yourself and your particular function at your organization?

Q2. How do you see the level of innovation adoption in the NHS England?

Q3. What are the various institutional incentives – or disincentives – within your organisation that influence the adoption of innovative health technology?

Q4. With regard to the regulatory system in the English public health system:

Q5. Coming to the specific features of the procurement processes itself – how does the current procurement system support innovation adoption? What are the general features that influence the adoption process?

Q6. How does the overall decision-making within procurement processes affect the adoption of innovations?

Q7. With regard to this, would you say that the overall procurement process is very similar or more idiosyncratic across the different individual regions?

Q8. Overall, what are the main values and principles that drive the decision-making process towards innovation adoption within the English NHS system?

Q9. To what extent do you think is the lack or the need for collaboration between stakeholders involved in the decision-making process a hindrance to innovation adoption?

Q10. Does the lack of or need of inter-organisational competition drive or hamper the procurement of innovative health technologies?

Q11. Would you be able to tell me whether there are any system wide expectations and top mandates that influence the procurement of innovative health technologies at NHS organisations?

Q12. Can you give me current examples of technologies that are:

a) pushed and are actually adopted?   b) pushed but fail to be adopted?

– END OF INTERVIEW GUIDE –
Annex 6: Case study protocol: interview themes for case study participants

Interview guide for the Ph.D. research project: Understanding the relationship between the adoption of innovation and institutions: An exploratory qualitative case study on NHS procurement.

Purpose: The purpose of this questionnaire is to derive an in-depth understanding of the specific procurement processes and structures related to the adoption of a new medical technology within an NHS organisation. The aim is to understand how these processes and structures affect the willingness and ability of organisations to buy and apply new medical technologies and to identify the features that impact on the overall adoption outcome.

Themes:

1. Personal Profile
   - Role and background at organisation
   - Involvement with the acquisition of the technology

2. Overview of adoption
   - Adoption timeline
   - Background for adoption
   - Business case/Processes and stages
   - Involved parties in the decision-making process

3. Technology features
   - Rationale of adoption
   - Current and potential impact on current performance (i.e. current practice vs. financial performance)
   - Perception of technology by individuals within the organisation and changes in perception over time
   - Requirement of additional resources or knowledge

4. Procurement & Decision-making process
   - More detailed description of procurement process
   - Evaluation of overall progress – what went well, what could be done better?
   - Decision-making process and level of involvement and roles of individuals

5. Regulatory environment
   - External regulations on adoption of new medical technology
   - Organisational regulations or policies on introducing new technology
   - Procurement and innovation specific rules
   - Other regulations, policies or incentives

6. Other comments, questions of elaboration from above, not covered.

– END OF INTERVIEW GUIDE –
Annex 7: List of non-publicly available documents used in the analysis

Documents for the Holmium Laser analysis:
- Holmium Laser Business case

Documents for the Robotic Surgery analysis:
- Procurement Request Form
- Capital Expenditure Approval

Documents for the Fibroscan analysis:
- Fibroscan Business case
- Techniques and Medical Devices Group Application form for the Introduction of a new Technique or Medical device
- Supplier Pre-Purchase Questionnaire
- Tender Specifications
- Supplier list of Fibroscan adoptions in the UK