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Development of a Framework for the Assessment of the Role and Impact of Technology on the Public Procurement Process: an Irish Health Sector Study

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Development of a Framework for the Assessment of the Role and Impact of Technology on the Public Procurement Process – an Irish Health Sector study

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Submitted for the award of PhD

Dublin Institute of Technology

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Abstract

This thesis sets out to examine how the role and impact of technology, in the context of the public procurement process, can be assessed by addressing it as a single bounded structural entity. The thesis specifically examines the procurement process in the Irish Health Sector. This thesis takes the view that context for the procurement process is critical and that adopting a structuration approach to the examination of the process allows for a greater understanding of the role of technology. The thesis is built around a thematic structure which examines the changing relationship between information technology systems and organisational structure. In particular the thesis focuses in on the interaction of technology and people in the context of a process.

The methodological approach is the development of case studies. Three case studies are examined in particular, the first two taking the traditional approach of examining technology impact on an organisation. The third case examines the impact on the procurement process itself. Findings illustrate that this approach is useful in identifying clusters of technology, which are generally seen in isolation in the traditional approach. A key finding is that the development of technology and its role and impact is influenced at a number of levels, from European Union to Organisational.

The use of Structuration as a basis for understanding the contextual settings, allows for the examination of the procurement process as single bounded structural entity, which is created by the social actors, the participants in the process. The combination of the Structuration approach and the conceptual model realises a way of examining processes that are not organisationally bound. This advances the development of the technology research discipline. The cases contribute to the empirical knowledge base by recounting sectoral changes that occurred in the Irish Health Sector during the research. The framework contributes to the theoretical knowledge by providing a novel and innovative approach to assessing the role and impact of technology on a process.

Keywords Procurement, Public Sector, Technology, Structuration

I certify that this thesis which I now submit for examination for the award of PhD, is entirely my own work and has not been taken from the work of others save and to the extent that such work has been cited and acknowledged within the text of my work.

This thesis was prepared according to the regulations for postgraduate study by research of the Dublin Institute of Technology and has not been submitted in whole or in part for an award in any other Institute or University.

The work reported on in this thesis conforms to the principles and requirements of the Institute's guidelines for ethics in research.

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Signature_____Date_____

Candidate

Acknowledgements

The self cannot be understood outside history- history meaning in this case the temporality of human practices (Giddens, 1984, p.36)

The research conducted to date is only a moment in an ongoing academic world of research. It is only a moment that may, when examined historically, be seen to have made a contribution to the world of knowledge.

I would like to thank my supervisors Dr. Steve Jerrams and Dr. Steve Martin who have been of tremendous support in this process.

I would like to thank my colleagues in DCU. I would like to especially acknowledge the support of Prof. Brian Leavy who has listened when it was needed.

I especially want to thank my wife Jude who has shown tremendous patience and who has been a rock for me to fall back on when the going was tough. And lastly my children who hopefully will in time acknowledge that public procurement is of interest.

Abbreviations

Business Process Reengineering	(BPR)
Chief Executive Officer	(CEO)
Data Processing	(DP)
Decision Support System	(DSS)
Dublin City University	(DCU)
Dublin City University Business School	(DCUBS)
Electronic	(e)
Electronic Procurement	(EP)
Enterprise Buyer Professional	(EBP)
Enterprise Resource Planning	(ERP)
Euro	(EUR)
European Community	(EC)
European Credit Transfer System	(ECTS)
European Journal	(OJEC)
Global E Schools Community Initiative	(GESCI)
Group Decision Support System	(GDSS)
Health Board Executive	(HeBE)
Health Service Procurement Group	(HSPG)
Higher Education and Training Academic Council	(HETAC)
Information Communication Technology	(ICT)
Information System	(IS)
Information Technology	(IT)
Institute of Public Administration	(IPA)
International Business Machines	(IBM)
International Purchasing and Supply Education Research Association	(IPSERA)
Irish Academy of Management	(IAM)
Irish Institute of Purchasing and Materials Management	(IIPMM)
Management Information Systems	(MIS)
Masters Business Administration	(MBA)
Masters Business Studies	(MBS)
Masters Industrial Engineering	(MIE)
National Public Procurement Policy Unit	(NPPPU)
Personal Computer	(PC)
Price Waterhouse Coopers	(PWC)
Regional Materials Management Group	(RMMG)
Research and Development	(R&D)
Strategic Information Systems	(SIS)
Supply Chain Management	(SCM)
Total Inventory Management	(TIM)
Total Quality Management	(TQM)
Trinity College Dublin	(TCD)
United Kingdom	(UK)
University College Cork	(UCC)
World Trade Organisation	(WTO)

Definitions

Definitions adopted by researchers are often not uniform, so key and controversial terms are defined here to establish positions taken in this research. It is thus important that these key terms used throughout the thesis are initially described in the light of the interpretation offered by the author. These terms will be discussed in the context of the literature review in Chapter 2, but it is important at this stage to define clearly what is meant and is being used throughout the thesis, for the position of the researcher to be clear.

Case (Eisenhardt, 1989; Yin, 1994)

One of the most important ideas in a research project is the unit of analysis. The unit of analysis is the major entity that is being analysed in the study. For instance, any of the following could be a unit of analysis in a study:

- individuals
- groups
- artefacts (books, photos, newspapers)
- geographical units (town, census tract, state)
- social interactions (dyadic relations, divorces, arrests)

For the purpose of this study, the case is seen as the unit of analysis. In the first two cases this is the purchasing organisation, while for the longitudinal case this in fact turns out to be the procurement process itself.

Logistics and Transportation

Christopher (1998,p.4) defines Logistics as

“... the process of strategically managing the procurement, movement and storage of materials, parts and finished inventory (and the related information flows) through to the organisation and its marketing channels in such a way that current and future profitability are maximised through the cost effective fulfilment of orders.”

For the purpose of this research, this definition will be adopted.

Process

Meláo and Pidd (2000,p.112) highlight four different perspectives on business processes. They state, “that business processes can be treated as deterministic machines, as complex dynamic systems, as interacting feedback loops and as social constructs”.

Davenport (1993, p.5) defines a (business) process as

”a structured, measured set of activities designed to produce a specific output for a particular customer or market. It implies a strong emphasis on how work is done within an organisation, in contrast to a product focus’s emphasis on what. A process is thus a specific ordering of work activities across time and space, with a beginning and an end, and clearly defined inputs and outputs: a structure for action. ... “

For the purpose of this research, a process is seen as a complex dynamic system, with a specific ordering of work activities across time and space, with a beginning and an end.

Procurement

Well Van Weele (2004,p.16), defines procurement as “All activities that are required in order to get the product/service from the supplier to its final destination “

Gershon (1999,p.5) defines it as

“... the whole process of acquisition from 3rd parties and covers goods, services, (ICT), and construction projects. The process spans the whole life cycle from the initial concept and definition of business needs through to the end of the useful life of a unit or end of a service contract.”

For the purposes of this research the definition offered by Gershon will be adapted.

Purchasing Management

Purchasing Management refers to all the activities necessary to manage supplier relationships.

Van Weele (2004,p.16) defines it as

“...the management of the company’s external resources in such a way that the supply of all goods, services, capabilities and knowledge which are necessary for running, maintaining and managing the company’s primary and support activities is secured at the most favourable conditions.”

For the purpose of this research, this definition will be adopted.

Supply Chain Management

There are a wide variety of definitions available for the term supply chain management. They include those of:

The Institute for Supply Management (2007), which describes supply chain management as

“...the design and management of seamless, value added processes across organisational boundaries to meet the real needs of the end customer. The development and integration of people and technological resources are critical to successful supply chain integration.”

The Supply-Chain Council’s (2004) definition of supply chain management, which is

“...managing supply and demand, sourcing raw materials and parts, manufacturing and assembly, warehousing and inventory tracking, order entry and order management, distribution across all channels, and delivery to the customer. ”

Simchi-Levi, Kaminsky, Simchi-Levi (2000,p.1), define it as

“... a set of approaches utilised to efficiently integrate suppliers, manufacturers, warehouses and stores, so that the merchandise is produced and distributed at the right quantities, to the right location, and at the right time, in order to minimise system-wide costs while satisfying service level requirements.”

The Council of Logistics Management (2002) defines supply chain management as

“... the process of planning and controlling the efficient, cost effective flow and storage of raw materials, in process inventory, finished goods, and related information from point of origin to point of consumption for the purpose of conforming to Customer requirements.”

For the purpose of this research, supply chain management will be seen as the management of the long-term relationship between a firm, its suppliers and its customers to ensure the timely delivery of goods and services that are competitively priced.

Technology

A number of definitions of technology are offered as starting points for this research. These include

Fletcher (1991,p.219)

Information Technology (IT) is the acquisition, processing, storage and dissemination of vocal, pictorial, textual and numeric information by microelectronics-based combination of computing and telecommunications.

Weill (1992, pp.307-333)

IT includes all hardware, software, communications, telephone and facsimile facilities

De Boer, Harick and Heijboer (2002,p.26)

Electronic procurement can be defined as using Internet Technology in the purchasing process – excludes old applications like ordering by telephone or by fax

For the purpose of the research the definition offered is that information technology should be viewed as the whole system rather than as separate technologies.

Value Chain Management

In 1985, Porter defined the Value Chain, as composed of value activities and a margin that is achieved by these activities. These activities included primary and support activities. Value Chain management is the management of these activities.

For the purpose of this research, this definition will be adopted.

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Chapter 1 Introduction

1.1 Introduction

This thesis sets out to examine the research question

How can the role and impact of technology on a process be assessed using the process as a single structural entity?

The research reflects a research journey, which has seen a transition from practice to academic research. The interest in the topic came from a problem encountered in the world of practice, that of making an assessment of how technology can best be used to support a business process. Though there is a body of literature on business process, few frameworks were found which could be used by the practitioner to assess the role of technology on a process as a single structural entity.

The chapter is presented in five main sections. Section 1.2 describes the background and broad field of analysis from where the study originates. Section 1.3 outlines the justification for the research. Section 1.4 describes the main features of the research design and methods and summarises the principal research findings. Section 1.5 gives an outline of the overall thesis, with a brief summary of the six chapters of the thesis. Section 1.6 examines briefly the delimitations of the research.

1.2 Broad Field / Background

The area of interest technology and the impact of technology, has long been researched, with research going back to the 1960's, but it is only since the late 1980's, with the growth in technology usage in organisations, that this research has taken on a multidisciplinary approach. The research carried out to date has however focused on organisations (Orlikowski (1989, 1992, 1996

and 2000). In particular the work of Giddens (1979, 1984) has been used extensively in the analyses of organisational processes (Barley, 1986; Manning, 1982; Pettigrew, 1985; Ranson and Greenwood, 1980; Willmott, 1987).

This work has been matched by research into business processes. The research into business processes originates from the work of Churchman (1971) and Checkland (1981), both of whom carried out work in the domain of systems theory. The emphasis on business process has grown again in parallel with the interest in supply chain management, starting with a renewed lease of life by Hammer and Champy in 1993.

These parallel streams of research have led to consideration of the research problem. In examining business processes how can the impact of technology be assessed?

One key objective of the thesis is to develop a framework, which can be used to assess the impact of technology on a single business process. In particular the research focuses on one process that of procurement as it is enacted in the public sector.

The research spans a number of different academic disciplines. These disciplines include supply chain management, public sector organisation, business process and technology.

Supply chain management as an academic field has been growing since the early 1990's to the present. There are ranges of definitions used for supply chain (for example Christopher, 1998; Simchi-Levi et al 2000; The Council of Logistics Management, 2002).

In 1993 the International Purchasing and Supply Education and Research Association (IPSERA) met for the first time and held their first conference. Since then, the level of research interest in supply chain has grown exponentially. However the simplest of definitions of supply chain '*Buy, Make,*

Store, Move and Sell perhaps gives some indication of the breadth of disciplines that are involved. These, for example, include purchasing, operations, distribution, marketing, and sales. The growth in interest in supply chain also mirrored the growth in interest in purchasing as a discipline.

Procurement can be seen as including all the activities required in order to get the product from the supplier to the final destination. It encompasses the purchasing function, stores, traffic and transportation, incoming inspection, and quality control and invoicing. Procurement spans the supply chain and the management of procurement in a modern organisation generally encompasses logistics management as well.

The literature emphasises, in the main logistics, supply chain management and procurement in the private sector (Inman and Hubler, 1992; Harland, 1994; Ellram and Pearson, 1994; Monczka, Trent and Callahan, 1994; Saunders, 1995; Lamming, 1996; Morgan and Monczka 1995 and 2000; Farley, 1997; Farmer, 1997; Tan, 2001; Van Weele, 2004; Giannakis and Croom, 2004). Public sector and not-for profit organisations that procure are not well represented. Yet for many suppliers the government represents a significant party. It is estimated that in Europe the value of public procurement amounts to EUR 900 billion or 12% of Community Gross Domestic Product for the member states (Figures relates to 1995: EC, 1999).

In the Republic of Ireland current research in Public Administration (Institute of Public Administration, 2002) has focused on a number of key areas. These have included and include,

- Strategic Management and Planning
- Service and Business Planning
- Programme and Policy Evaluation
- Improving Service Delivery
- Human Resource Management
- Equality of Opportunity
- Partnership
- Management of Cross-cutting issues

- Governance and Accountability

There was no research being carried out in the area of public procurement in Ireland at the time of writing of this thesis. Research in the area of public procurement has really only grown since the early 2000's. The first journal dedicated to the topic of public procurement ("The International Journal of Public Procurement") was only launched in 2000. The first international public procurement conference for researchers was only held in 2003 (IPPC, 2003). None of this work to date has involved the assessment of technology on the procurement process as single structural entity.

1.3 Justification for the Research

When organisations, public or private, are examined, it is clear that the process view of the organisation tends to differ from the traditional functional view. In the last few years, organisations have become reticent in adopting business process re-engineering techniques. However with the development in technology and in particular with the rise of enterprise resource planning, focus has shifted in research from looking at what efficiency and effectiveness gains have been made through the implementation of such technology to the impact of technology itself on the organisation. This shift has prompted the research to be focused on developing a framework for assessing the impact of technology on a business process. Given that a business process may span organisational boundaries the approach taken by previous researchers (for example Orlikowski and Robey, 1991; Rose and Hackney, 2003) of examining the impact on organisation needs to be adapted to examine inter and intra-organisational processes. Technology is generally viewed by managers in clusters (Brady, 2003) and therefore it is proposed to research the impact of technology in this way for this thesis.

Previous research on the impact of technology has taken a variety of research perspectives (Orlikowski, 2000). These are discussed in some detail in Chapter 2, Chapter 3 and Chapter 4. The developments in organisational research and in particular the use of case research in building theory has

been critical in influencing the direction of this research. Thus, the research builds on previous approaches to case study and adds to the literature by taking two different case approaches, the first examining the impact of technology at an organisational level (the traditional approach), the second comparing the first with the impact of technology at a process level (the new approach).

Giddens (1984) offers a view of role and social position. All roles that one plays or acts out are important elements in examining research. In particular the role played by one whose background is practitioner based and not academic based. Giddens (1984, p.84) adopts a formulation of role and social position: A social position can be regarded as a social identity that carries with it a certain range (however diffusely specified) of identity. This position (or an incumbent of that position) may activate or carry out prerogatives and obligations that constitute the role prescriptions associated with that position. The association of role and process is examined in this research.

All methods of inquiry about human communication begin with a question. This question can fall into one of four categories and they define the problem that needs to be solved. The questions are of definition, fact, value and policy (Stacks, 1992, pp. 7, 15-16)

- Questions of definition can either be reportive, for example, the conventional meaning for terms such as definitions in a dictionary, or they can be simulative, whereby the researcher specifies what is meant by a particular term, this may be an operational definition, defining variables in specific or concrete terms.
- Questions of fact seek to answer questions about the nature of the world in our observable environment. They are empirical questions that can (potentially) be verified or refuted by research, for example, “did more people watch the football or hurling All Ireland Final?”

- Questions of value ask whether an object, situation, or behaviour is perceived as good or bad, right or wrong, strong or weak, attractive or unattractive, etc.. The 'answers' are subjective to each person, for example, "Is Gaelic football a superior sport to soccer?"
- Questions of policy seek to prescribe prudent courses of action for formal organisations (such as governments and educational institutions) to enact, under a certain set of circumstances. These questions usually require analysis of both questions of fact and questions of value and they tend to be complex questions that give rise to a variety of arguments rather than definitive answers.

A problem never exists until it has been defined (Stacks, 1992). The problem emerges from the questions that are asked. Definitions are the key. The problem(s) are always emerging in different heads at different rates. Researchers with different interests, different world-views and different perspective pursue different problems.

Two streams; purchasing and supply activities and transportation and logistics functions have emerged and have been found to be a way of analysing the development of the literature in the area of supply chain management. Most of the recent literature on supply chain management adopts a purchasing and supply perspective. However the perspective of procurement has not been examined in any great detail. The perspective on supply chain management has evolved from the traditional purchasing and supply management functions. A number of models have been developed to understand the evolution of purchasing (Syson, 1982; Reck and Long, 1988; Morris and Calantone, 1991; Stannack and Jones, 1996). These frameworks show that conceptually purchasing has developed a theoretical base on which research can and has been built. This research adds to that theoretical base.

The background of practice in the areas of technology and supply chain has led to the academic research of these topics within the public sector. Since 2001, and the release of the e-Procurement Strategy document in Ireland, it

has been a time of growth in e-commerce, growth in e-government, and particularly in e-procurement. The choice to examine the public sector was driven by questions of value. Which would be of more value, research in private sector where there was a large amount of literature written or research in the public sector where there was a dearth of information?

The contributions from this research are broken into two areas, theoretical and empirical. Firstly, dealing with the empirical, the contributions made include

- The health sector case study is the first health sector case study in Ireland in procurement,
- The sectoral case study is also a first in Ireland,
- The examination of a longitudinal case is the first in Ireland in the area of procurement.

Secondly, the theoretical contributions made include

- The conceptual framework proposed is new and has not been tested or documented. It is novel in that it relates context, technology and process,
- The definition of the process as an independent structure is novel, and thus,
- The proposed approach of the application of Structuration theory to examining the process and the impact of technology is novel,
- The combination of the Structuration approach and the conceptual framework realises a way of examining processes that are not organisationally bound, nor sectorally bound.

1.4 Methodology

The methodology and research design is described in Chapter 4. There is a general belief that research should start with a clear and accurate research question that guides the researcher throughout the research (Brannick and

Roche, 1997, pp.6-7). In essence this is what happened here. However although this general belief draws from the quantitative research field, there is a strong tendency in qualitative research to start with a less focused approach, which develops over the course of the research. A clear generalised research question was the initial starting point for this research. This generated a series of questions at the start of the research and over time these research questions were refined and the area of research focused in upon. It is thus critical that, in order to defend the research the methodology is shown to be appropriate. Thus Chapters 3 sets out the theoretical background (structuration) and frameworks for the capturing and analysis of results. Chapter 4 lays out the approach, the protocols and procedures followed throughout the research.

1.5 Outline of the Thesis

The thesis follows a structure, which allows theory to be developed. The research question was made more specific over the course of the research and became,

How can the role and impact of technology, in the context of the public procurement process, be assessed by addressing the process as a single bounded structural entity?

Figure 1 illustrates the overall approach taken to addressing this research question. In this section, an overview of each chapter is presented and how each of these chapters is related back to the overall approach is then outlined.

As figure 1 illustrates, the pre-study interviews and the literature review contributed to the development of initial framework. Cases 1 and 2 informed the research on the framework and on the procurement process itself, which was developed further with the longitudinal study. This led to the final framework as presented in this research.

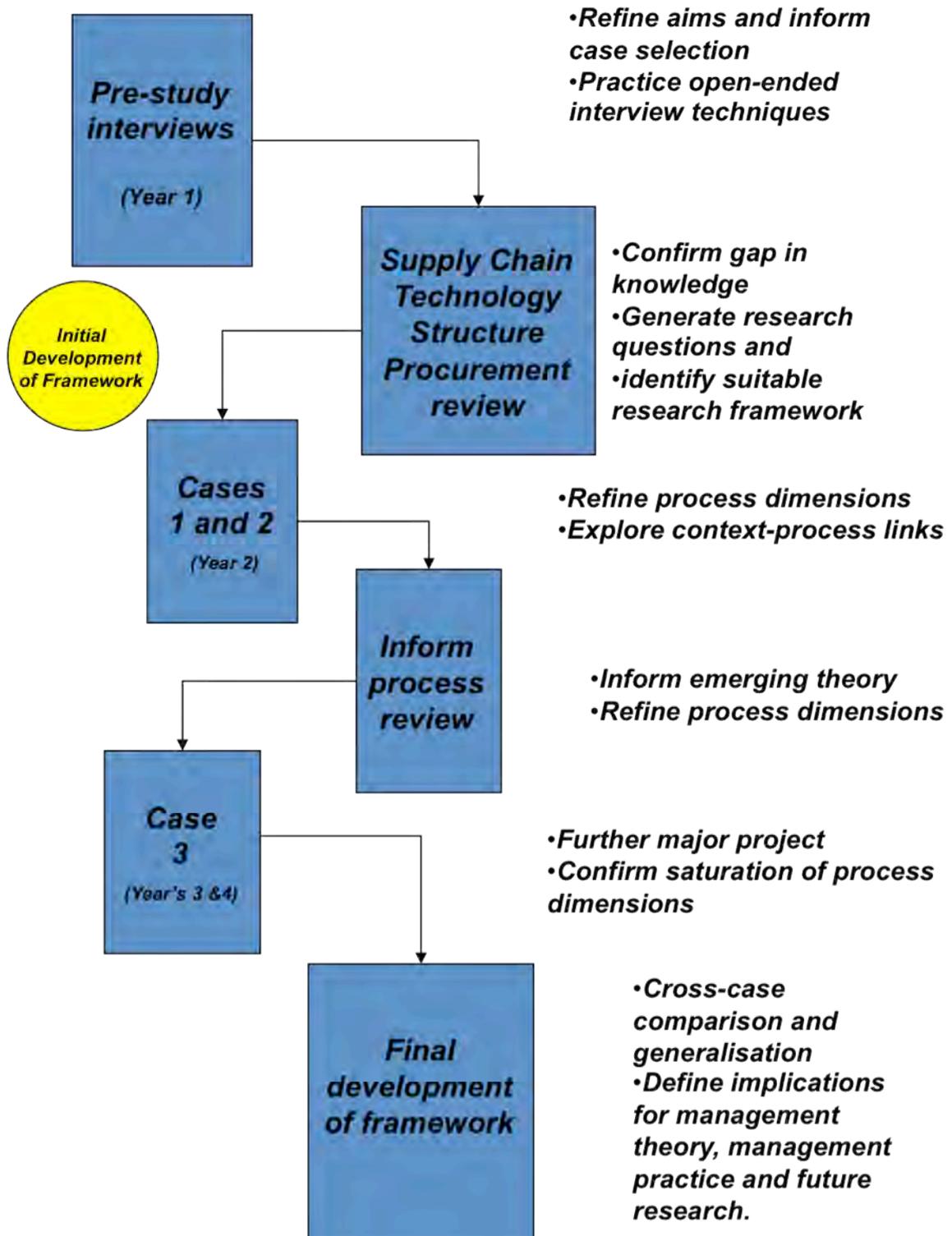


Figure 1 : Outline of Thesis Approach

The thesis is structured in 7 chapters that allow for ease of presentation of the research. This approach itself involved much iteration as described in Chapter 4.

Chapter 1 sets out the background and introduction to the thesis. The methodological position is outlined and the fieldwork settings are described. The research design, principal findings and thesis structure are summarised.

Chapter 2 is a review of literature encompassing the broad areas of supply management, purchasing, procurement, technology, and public sector. The review seeks to capture what is known about the ways in which processes are examined in research and to examine the development of research in the area of technology.

Chapter 3 examines, specifically the literature in the area of structure. The review finds a bias towards an examination of structure. Between the generalised literature of procurement, supply and technology and the specific structuration literature, a clear gap was identified where the impact of technology on process is not researched.

Chapter 3 also shows the development of the initial framework from the gaps in the literature. It is argued that this gap resulted in the impact of technology on procurement processes not being assessed. It is also shown that the context in which currently applicable processes and technologies are examined is critical to assessing the impact of technology on the process itself. The review leads to the formulation of a number of objectives, which provided a guiding foundation to the design of the empirical study. The objectives address the research question through examining the role and impact of technology in three cases.

This is linked to Chapter 4, which describes the debate about research philosophy as well as the approach taken to the design of the research and a justification of the methodology chosen. Throughout this chapter, there is reflection on the process carried out. Following on from this, a description is given of the research strategy, outlining the procedures and protocols implemented during the research. A brief discussion follows on the limitations of the research. Finally, some of the ethical considerations taken into account when conducting the study are explored. The overall purpose of this chapter

is to describe, in detail, the approach taken to the research. Designing the methodology and the research process should be undertaken with the research question in mind; because of this a structured approach is shown.

Chapter 5 describes the cases and the analysis of the cases. It draws on the pre-study interviews and the cases examined at an organisational level and at a process level. This chapter describes the cases of two independent teaching hospitals and then follows this with a narrative description and analysis of the longitudinal case carried out in a regional area of the health sector. The chapter though begins with a context setting analysis of the development of the Irish public sector and in particular the Irish health sector prior to the primary research, as well as including developments that took place during the research, which had implications for the assessment framework.

Chapter 6 brings together the findings from the three cases in a cross-case comparison and discussion. The output of the research is presented as a series of analyses across the themes set out in chapters 2 and 3. The key issue of role and impact of technology and the development of the framework for analysis is addressed in this discussion. The central issues from all cases are aggregated into a framework that can be used by both researchers and practitioners in assessing the role and impact of technology on a process. The research contributions to knowledge are presented here, followed by a discussion of implications for management practice, including practical advice for managers.

Chapter 7 draws conclusions from the whole study. The chapter closes with an acknowledgment of the shortcomings of the research and a consideration of opportunities for further study, which have arisen from this work.

The research questions are,

1. What roles does technology play in the procurement process?
2. How does technology impact the procurement process?

3. Why does technology impact the procurement process in the way that it does?

These questions came from the literature and are explored in chapters 2 and 3.

From these questions a series of objectives were set. These are developed and discussed in greater detail in chapters 2 and 3, and are shown to have been met in chapters 6 and 7. The research objectives were,

- To show the drivers for the public procurement process in the Republic of Ireland since 1990 – this addresses themes and research questions
- To illustrate the internal and external drivers for the introduction of technology into the public procurement process – this addresses themes and research questions
- To map the public procurement process within the Irish Health Sector – this addresses themes and research questions
- To demonstrate that the procurement process can be examined as single structural entity –this addresses themes and research questions
- To demonstrate that technology impact on process can only be examined through an understanding of context – this addresses themes and research questions
- To develop a conceptual framework for the assessment of the role of technology on the public procurement process and to show its practical use – this addresses themes and research questions

1.6 Limitations of the research

The research is bounded by both time and cost constraints. For any piece of research, there is always a practical limit placed on how much time can be spent in the field versus the time available for analysis. For this thesis, one of

the boundaries set out was balancing the work for the thesis with the work of teaching. It was possible to introduce elements of the research into teaching at a very early stage and so validate the usefulness of the research.

The second boundary limit set was clearly that the research was focused on a live case, or rather a number of cases. So, access to cases placed a boundary. Another factor that played a part in setting this boundary was the fact that the research was focused within the public sector so there were issues of confidentiality that had to be resolved.

The study is not ethnographic. Even though it takes a longitudinal approach it gives, instead, a broad overview of the current process in a given context. This is a limitation that is considered justifiable given the timeframe and research aims of the study. In any study, it is always desirable to have more data than less, provided the data is of the requisite quality. This study was however based on a limited population, another boundary placed on the research. Further, given the opportunistic nature of the study and the time scale limitations, compromise of the ideal was inevitable. Despite all of these boundaries being in place, the quality of data was not hindered. The access when granted, gave insights into the process that could not have been achieved using any other methodological approach.

There has been a great many hours spent collecting, processing, analysing and re-analysing the data from the three case studies and the context setting interviews. The range of interviews given also reflects the delimitation of the research. The access to outside consultants and to central policy makers was essential in forming a context for developing the thesis.

Because of the need to take a pragmatic approach to field access, to experiment with new techniques and, at the same time, to develop a more informed and critical understanding of the position and use of qualitative research, the output of this research project has this limitation on its scope. It was critical that the framework was established and that the comparison of

the cases should be distinct such that the approach of analysing process rather than organisation was clear.

The research is focused on a single process and as such the scope of the research did not examine other processes that may or may not have an impact on the process itself. Where technology was examined and assessed, this was limited to the basic proposition that the technology is used in the process and it either directly or indirectly supports the process. Only technology falling within this scope was included.

1.7 Chapter Summary

This chapter has outlined the approach taken to this doctoral research. It has described the background to the research and the range of disciplines the research encompasses. The justification for the research has been outlined, as have some of the main features of the research design. The research question being explored in this research is,

How can the role and impact of technology, in the context of the public procurement process, be assessed by addressing the process as a single bounded structural entity?

In the next chapter the detailed review of the literature is given. This sets the background and context for the research in academic theory. The literature review builds on the introduction to the broad disciplines and sets out the research themes and the research questions.

Chapter 2 Literature Review

2.1 Introduction

This review is built around a number of key themes. These are,

- Theme 1 the changing relationship between IT systems and organisational structure,
- Theme 2 technology in the context of procurement,
- Theme 3 a focus on public sector,
- Theme 4 the interaction of technology and people in the context of a process,
- Theme 5 the research of the public procurement process in a single constituency,
- Theme 6 the context within which the procurement process is carried out.

These themes are built from the research question

How can the role and impact of technology, in the context of the public procurement process, be assessed by addressing the process as a single bounded structural entity?

The literature review is constructed to show the acquisition of knowledge and insight obtained in researching these themes. These themes allowed the integration of the literature such that a set of objectives for the research could be set out. This review explores the main topics of procurement and technology from their development as theoretical concepts to the current research issues that were relevant for this study, more importantly the review enables the academic rigour for the research to be established. Figure 2 shows the outline chart of the literature review.

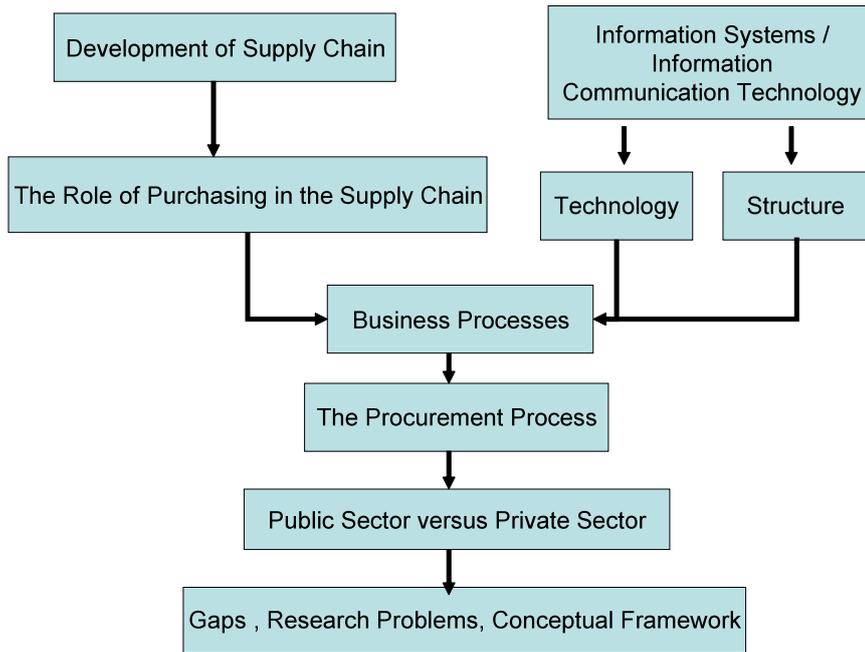


Figure 2 : Literature Review Structure

Two streams of literature were reviewed initially, the supply chain and purchasing and information systems and technology. As the review developed a common topic emerged that of the business process, this was then specifically focused on the procurement process and further refined to the public sector. In Section 2.2 the background and development of supply chain management is outlined. This illustrates the development of the field in two main areas that of supply and purchasing and that of logistics and transportation. Section 2.3 builds on the development of the supply and purchasing research and shows the role of purchasing in the supply chain. It shows the development from the value chain concept of Porter in 1985 through to the role of purchasing as described by Van Weele in 2004. Section 2.4 describes business processes and shows how the supply chain is seen as an integration of business processes. It examines the role of business processes and in particular offers a definition of a business process that is used throughout the research. This section shows how a process can be bounded and limited. At this stage a new topic emerges and is dealt with; that of technology. Paralleling the growth in interest in supply chain management has been the development of Information Systems and Information Communication Technology. This development has also led to an increase in

research in this area. This section introduces the background to the development and the background to research carried out. It leads to Section 2.5, which outlines the background to and the role of technology for purchasing. These strands are merged in Section 2.6, which describes specifically the role of technology for procurement. The concept of structure and structuration is introduced which is described in more detail in Chapter 3. Section 2.7 builds on the development of business processes in this new context. Section 2.8 rebuilds the definition of procurement, which is presented as a process, which has been defined as a social system. In Section 2.9, this is developed further, by contrasting the public and private sector procurement regimes, which shows that the public is more tightly bounded and structured than the private sector. Section 2.10 summarises the standard literature to date and links to Chapter 3, which looks at the use of structuration to examine the procurement process and the impact of technology.

2.2 Development of Supply Chain Management

The history of supply chain management cannot be divorced from the development of operations management. Voss (2007) illustrates that the first operations textbook was “De Re Metallica” by Georgius Agricola published in 1556. However Voss goes further to state “... that it is possible that this early writing in the West was matched if not preceded by that in both the Arab World and China” (2007,p.1). If however operations management can be shown to have first made its impact in 1556, purchasing can be traced back to the time of the pyramids from when there are records of purchase orders for provisions for the labourers written on a cuneiform clay table excavated at El-Rash Shamra, dated about 2800 BC (Lysons and Gillingham, 2003, p.9). If the first recorded steps of purchasing can be seen here, certainly then it is in the 19th and early 20th century that the development of processes that support both manufacture and services were really seen to grow (Sprague, 2007). However it is only since the 1950’s and 1960’s with the growth in mass production that manufacturers looked to new concepts in materials management to find ways of improving performance (Tan, 2001). Throughout

the next three decades there were further developments in materials management and logistics functions, but with Porters concept of value chain in 1985, came the next major advancement in supply chain management. As organisations looked to their value chain, the development of strategic partners who could carry out activities that had normally been carried out internally grew. Parallel to these changes were changes in technology described in greater details in Section 2.6. This growth in technology enabled supply activities to be carried out not just locally but also globally.

Throughout this period there has been a growth in research in the area of supply chain management. Figure 3 (adapted from Tan, 2001) presents a summary framework of the evolution of supply chain management that has according to Tan merged two fields of study – that of purchasing and supply and that of transportation and logistics. The emphasis here has been placed on the purchasing and supply activities, where the objectives of many of the research projects have been to examine the effects in organisations of supply base reduction, concurrent engineering, cycle time reduction, inventory reduction, changes in customer satisfaction and the development of a process orientation.

These two streams of Purchasing and Supply Activities and Transportation and Logistics functions are just one way of analysing the development of the literature. Giannakis and Croom (2004, p.28) remark that

“ researchers in the field of scm (Ellram and Cooper, 1993; Harland,1994, 1996; Saunders, 1995; Cooper, Lambert and Pagh, 1997, Morgan and Monzka ,1995 ; Lumus and Vorkurka, 1999) have stressed that supply chain management has evolved largely through an increasing trend toward the externalisation of performance management (Harland, 1994).”

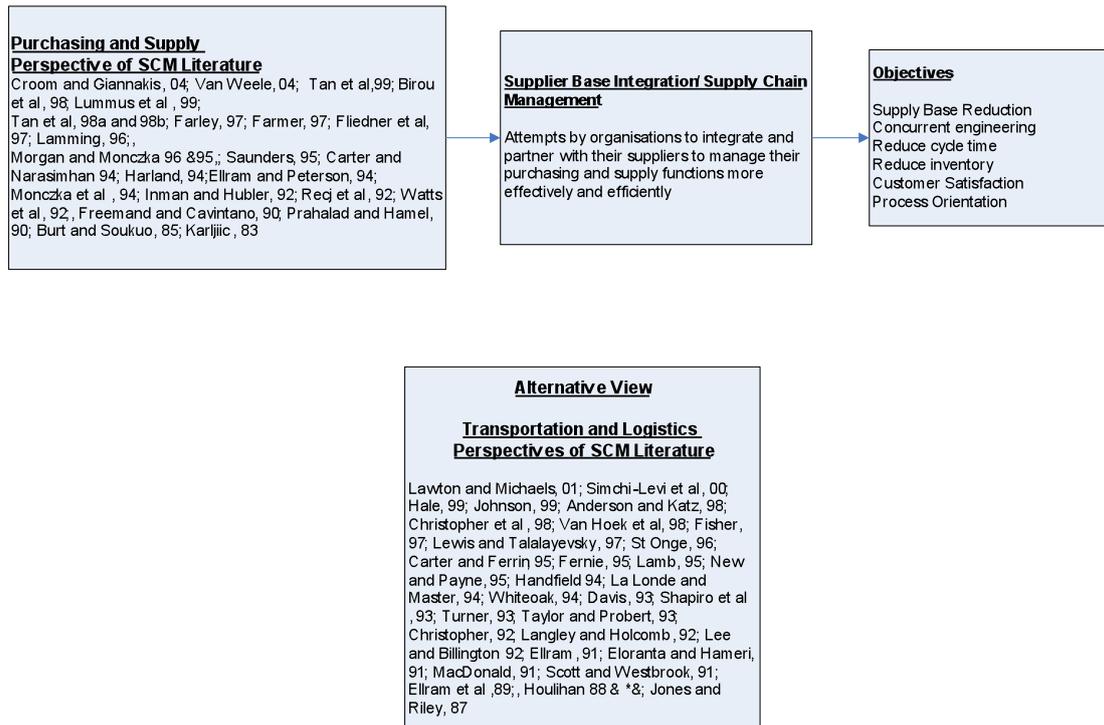


Figure 3 : Development of Procurement and Supply Research (adapted from Tan, 2001)

Most of the literature on supply chain management adopts a purchasing and supply perspective (e.g. Kraljic, 1993; Morgan and Monzka, 1995; Lamming and Hampson, 1996; Farmer, 1997). This perspective on supply chain management has evolved from the traditional purchasing and supply management functions. It emphasises that purchasing and materials management represents a basic strategic business process, rather than a narrow specialised supporting function to overall business strategy (Reck and Long, 1988).

As Harwick, (1997, p.43), says "...it is a management philosophy that extends traditional internal activities by embracing an inter-enterprise scope, bringing trading partners together with the goal of optimisation and efficiency".

There are a number of definitions of supply chain that are available in both the literature and from professional associations (Institute of Supply Management, 2007; Supply Chain Council, 2004; Christopher, 1998; Simchi Levi et al., 2000; Council of Logistics Management, 1998). What is common is the theme

of the chain being a process that is managed. What is also evident is that information related to the process is critical and fundamental for both the control and understanding of the process.

In 1985, Porter defined the value chain, as composed of value activities and a margin that is achieved by these activities. This parallels the concept of the supply chain. Porter went further and described how there were primary and support activities. Procurement as an activity within the value chain was seen as a support activity and in fact relates to the function of purchasing inputs used in an organisation's value chain. These inputs may include raw materials, supplies and other consumables as well as assets such as machinery, laboratory equipment, office equipment, buildings etc. It may also include the purchasing of services.

The development of the purchasing function has also to be considered. Despite the long history (for example from the cuneiform tablet, Lysons and Gillingham, 2003), it is only in the latter half of the 20th century that the importance of efficient purchasing has been widely recognised (Giannakis and Croom, 2004). It was even later when its strategic importance as opposed to its operational significance was acknowledged with the emphasis shifting to process, relationships and performance rather than products.

A number of models have been developed to understand the evolution of purchasing (Reck and Long, 1988; Morris and Calantone, 1991; Stannack and Jones, 1996; Syson, 1992). Table 1 shows the main features of each of these models. These frameworks show that conceptually a theoretical base has been developed upon which research can be built for purchasing. The frameworks are useful for assessing the stage of maturity of an organisation's purchasing function. Each of the models offers an explanation of how purchasing has developed or can be developed within an organisation. Stage 1 is common across models, beginning with a transaction approach where the purchasing function is not seen as a value adding activity. The final stage for three of the models sees purchasing taking on development and a proactive, strategic role. Reck and Long (1988) do not see this but rather take the view

similar to Porter (1985) that purchasing is at its most developed a supportive function. The development stage for each model differs, but in reading the literature this is more reflective of the background of the researchers than of the stages that the function goes through. The models do not reveal anything about the purchasing process itself, which is interesting as an understanding of the process is fundamental to the understanding the stage that an organisation is at in its development. No new models of strategic purchasing have emerged in recent years.

Stannack and Jones 1996	Reck and Long 1988	Sysons, 1988 Morris and Calantone, 1991	Jones, 1997
Stage 1 Product Centred Purchasing	Stage 1 Passive	Stage 1 Clerical Routine Activity	Stage 1 Infant
			Stage 2 Awakening
Stage 2 Process Centred Purchasing	Stage 2 Independent	Stage 2 Commercial	Stage 3 Developing
Stage 3 Relational Purchasing	Stage 3 Supportive		Stage 4 Mature
Stage 4 Performance Centred Purchasing		Stage 3 Proactive	Stage 5 Advanced

Table 1 : Developmental Models of Purchasing

This section assembled the background to the development of supply chain management as an academic discipline and as a research area. It introduced the concept of purchasing and showed that this concept has now developed its own discipline. In the next section the role of purchasing in the supply chain itself will be explored. The concept of process and purchasing being a process will also be initially explored in this section.

2.3 The role of Purchasing in supply chain management

Every organisation can be considered as “a collection of activities that are performed to design, produce, market, deliver and support products” (Porter, 1985, p.36) or services that are of value to customers. Lawton and Michaels (2001, p.94) note that the arrangement of a firm’s value chain, in other words

the decisions relating to the technology, process and location and whether to make or buy for each of these activities, is according to Porter the basis for an organisations competitive advantage. Procurement was originally seen as a primary activity associated with operations, but has been moved to a support activity. Lawton and Michaels go further and state that “The value chain is in turn, part of a larger value system that incorporates all the value added activities from suppliers of raw materials to component and final assembly through to buyer distribution channels” (Lawton and Michaels, 2001,p.94). In order to understand how these services and products are produced it is helpful to take a process view of the organisation. It is also necessary to understand why it is important for cross-functional co-ordination to take place in the delivery of these products and services.

Davenport (1993) defined a process as having structure, a set of activities that could be measured designed to produce or service a customer. There was an emphasis in the definition on how work is carried out in an organisation, rather than an emphasis on product, as is traditional in most manufacturing organisations.

This process was seen as an “ordering of work activities across time and space, with a beginning and an end and clearly defined inputs and outputs: a structure for action....Taking a process approach implies adopting the customer’s point of view. Processes are the structure by which an organisation does what is necessary to produce value for its customers” (Davenport, 1993, pp. 5-7).

McCormack and Johnson (2001, p.5) define a process as “... a specific set of activities and subordinate tasks which results in the performance of a service that is of value.” When organisations are examined, be they public or private, it is often seen that a process view of the organisation tends to differ from the traditional view. This is explained in detail in Section 2.4. But for now it is as well to describe a value chain as involving linkages between processes. The cumulative work of the processes of an organisation is its value chain. Adding the two concepts of process and value chain together is important, because processes are consumers of resources and need to be assessed not only in

terms of the value they add but also the amount of employees, managers, equipment, facilities, materials, services, land and energy that they consume in the creation of the value.

The concept of value chains reinforces the interconnectedness of processes to business performance (Krajewski and Ritzman, 2005). A weak link in the chain can cause the chain to fail. The concept of value chains also focuses attention on the type of processes in the value chain. For example a core/primary process is a chain of activities that delivers value to external customers. These processes interact with external customers and build relationships with them, develop new services and products, interact with external suppliers and produce the service or product for the external customer. Examples include reservation handling, new car design, web-based purchasing and loan processing. Another type of process is the secondary/support process, which provides vital resources and inputs to the core processes and therefore is essential to the management of the business. Examples include budgeting, recruiting and scheduling. It can be debatable for organisations what is core and what is supporting.

Given the focus on activities and processes that the value chain brings, current interests for organisations have been in what is core and what is supporting (Krajewski, & Ritzmann, 2005; Van Weele, 2004). If the core can be identified, then perhaps someone else can perform the other activities and these non-core activities can be outsourced.

Outsourcing had been traditionally considered a strategic peripheral issue, or merely an extension of the 'make or buy' decision. More recently it has moved beyond that, to where it is seen by many organisations as a core business strategy. It has become the norm rather than the exception. What is found here is that "often specialist suppliers can perform the outsourced activities at lower cost and will have higher value added than the buyer" (Van Weele, 2004, p.18). This move to strategic business activity has meant also that procurement has moved from a peripheral activity to a more core strategic activity.

Well Van Weele (2004, p.15), defines procurement as

‘All activities that are required in order to get the product/service from the supplier to its final destination’. This may mean managing internal processes but also external processes which have been perhaps outsourced or maybe even the management of the outsourcing itself.

This is clearly illustrated in Figure 4. The relationship of the procurement process and other related concepts is well laid out and it can be seen that procurement and supply chain management interact and overlap. Procurement can as a function include the following activities: purchasing, stores, traffic and transportation, incoming inspection and quality control and assurance, although the activities under the control of procurement will vary from organisation to organisation.

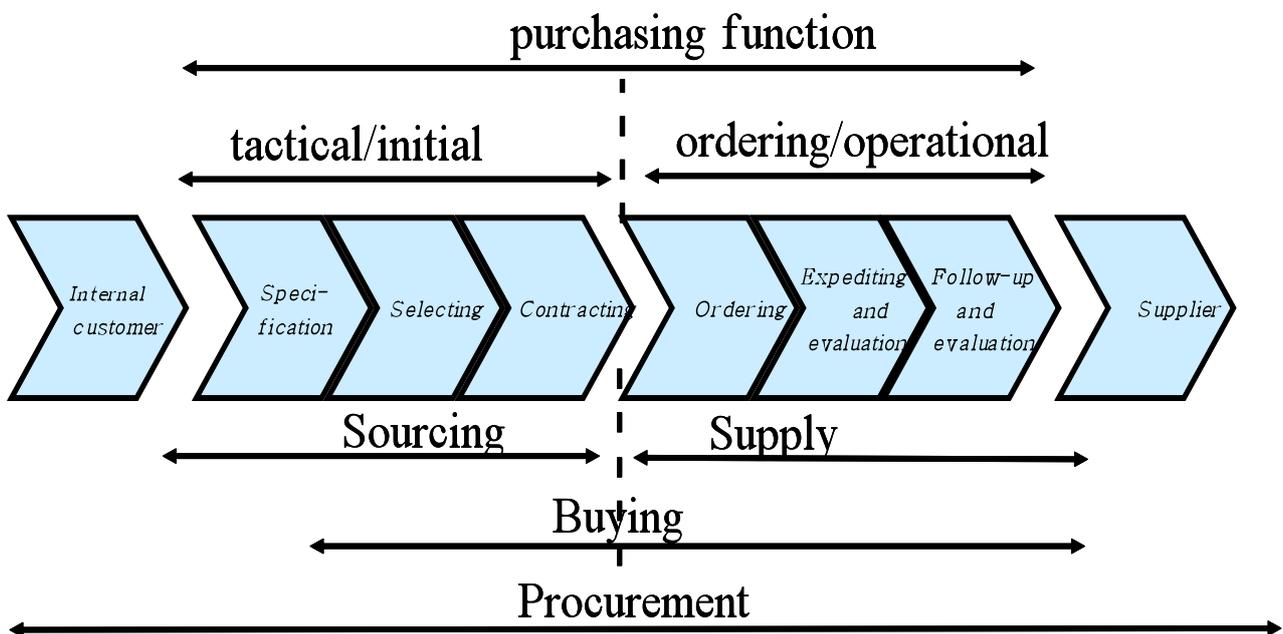


Figure 4 : Procurement (adapted from Van Weele, 2004, p.15)

Van Weele (2004, p.15) states “Purchasing Management refers to all the activities necessary to manage supplier relationships.” This involves the steps, specification, selecting, contracting, ordering, expediting and follow-up for example. Generally organisations will have a range of activities that fall into this process. These include the activities that fall also within the scope of supply chain management. So supply chain management would encompass the organisation “of the cost effective flow and storage of materials, in process inventory, finished goods, and related information from the point of origin to the point of consumption” (Council of Logistics Management, as cited in Lambert, 2008, p.4) to satisfy customer requirements. Van Weele (2004, p.16) further explains and says that it is “... the management of all activities, information, knowledge and financial resources associated with the flow and transformation of the goods and services...” The difference between both supply chain management and purchasing management is that supply chain management also encompasses all the logistics activities.

Value chain management as shown goes further than either of these two concepts. Again as Van Weele (2004, p.16) notes, value chain management is where “...suppliers are challenged by the larger organisation to improve the value proposition to their customers.” This can occur through the integration of design, build and marketing activities. This integration of activities between suppliers and customers has been one of the key new developments both in purchasing and supply chain management. This section expanded the definition of purchasing to procurement and as such has shown that procurement encompasses a wide set of activities. The concept of process was introduced, as a set of activities. In the next section this concept is further developed.

2.4 Process

The McCormack and Johnson (2001, p.5) definition of a process as “a specific group of activities and subordinate tasks, which results in the performance of a service that is of value”, is of critical importance when examining organisations. When organisations public or private, are examined it is clear

that the process view of the organisation tends to differ from the traditional functional view. This is clearly seen in Table 2.

Process View	Functional View
Emphasis is on “how work is done”	Emphasis is on which products or services are delivered
Cross-functional co-ordination, teamwork	Frequent “hand-offs” among functions which remain largely uncoordinated
Entire process is managed	Pieces of the process are managed
Customer Orientation	Internal orientation

Table 2 : Process View vs. Traditional Functional View (adapted from Mc Cormack and Johnson 2001, p.5)

Cooper et al (1997, p.2) define supply chain management as “... the integration of key business processes from end user through original suppliers that provides products, services and information for customers and other stakeholders.”

The achievement of efficient and effective co-ordination among the various activities in business processes within companies is one of the issues most thoroughly investigated by organisational researchers (Thompson, 1967, Galbraith, 1977, Mintzberg, 1979).

Prasad (1999, p.178), defined a process as a set of 7Ts (Talent, tasks, teams, techniques, technology, time, tools) arranged in a particular manner so as to transform a set of inputs into a specified set of outputs (goods or services). Hammer and Champy (1993, p.48) said that some process possibilities could be more efficient or effective than others, in other words doing more with less. This meant that teams and tasks could be arranged in many different ways, in order to perform the set of 7T's as identified by Prasad (1999, p.179).

Hammer and Champy's (1993) definition can be considered as a subset of Davenport's definition outlined in the definitions, pages 6 to 10. They describe

a process as a collection of activities. These activities can take one or more kinds of input and create an output that is of value to the customer.

Hammer and Champy in examining process are more focused on the transformation of the processes for example they have a more transformation oriented perception. Hammer and Champy do not emphasise the structural component–process boundaries nor do they wish to consider the order of activities in both time and space.

Rummler & Brache (1990, p.45) use a definition that clearly encompasses a focus on the organisation's external customers, when stating that

”a business process is a series of steps designed to produce a product or service. Most processes are cross functional, spanning the ‘white space’ between the boxes on the organisation chart. Some processes result in a product or service that is received by an organisation's external customer. We call these primary processes. Other processes produce products that are invisible to the external customer but essential to the effective management of the business. We call these support processes.”

There are many classifications of business processes as well as many different modelling techniques (Aguiler–Saven, 2003). These include flowcharting, data flow diagrams, role activity diagrams, role interaction diagrams, gantt charts, IDEF, coloured petri-net, object oriented methods and workflow techniques. A number of techniques for modelling business processes also exist, including Structured Systems Analysis and Design Methodology (SSADM), soft systems methodology and simulation, to mention but a few.

Johansson, Mc Hugh, Pendlebury and Wheeler (1994, p.10) defined “business process engineering as a means by which an organisation can achieve radical change in performance as measured by cost, cycle time, service and quality”. Hammer and Champy (1993, p.32), the leading figures in the discipline, described re-engineering as ‘a clean sheet redesign of the

organisation' and so Business Process Re-engineering has become a leading tool for business improvement.

"Many progressive organisations are interested in maintaining a competitive edge and / or delivering high quality products or services" (Liker, Ettlíe and Campbell in Prasad, 1999, p.179). Ezop, Jacoby and Leach (1989) suggested that to increase an organisations productivity the current operations had to be made more efficient. This could mean a number of things, for example, ensuring workers increase work rate, taking a process rather than a functional view or the automation of certain tasks (Hammer, 1990) through the introduction of technology. Automation does not necessarily mean getting things right, the same errors or mistakes that were embedded before may only be repeated but faster with the introduction of automation..

"Many organisations are finding the true increase in productivity and efficiency begins with such factors as clean and efficient process, good communication infrastructure, teamwork (Clark and Fujiomoto, 1991), empowerment (Carroll, 1997) and a constancy of shared vision and purpose (Deming, 1993)" (Prasad, 1999, p.179)

The objective then is not to speed up but rather to change the structures of the process either through changing the machines or the process itself. Many companies and organisations are using techniques, which include for example "concurrent engineering, benchmarking, improved data management, organisation restructuring (Dong, 1995; Juran and Gryna, 1993), T's renovation (Prasad, 1996) and business process re-engineering (for example. Hammer, 1990; Hammer and Champy, 1993; Roberts, 1994)" as cited in Prasad, 1999, p.179.

In trying to increase competition and satisfy more demanding customers Reijers (2006, p.392), has suggested that companies put less emphasis on hierarchical and functional structures, but instead focus and improve on entire chains of business operations ranging from client to client. Gardner (2004)

has described these as process focused operations, similar to Mc Cormack and Johnsons definitions.

In the last few years organisations have become reticent in adopting business process re-engineering techniques. However with the development in technology and in particular with the rise of enterprise resource planning (Holland, Light and Gibson, 1999), focus has shifted in research from looking at what efficiency and effectiveness gains have been made through the implementation of such technology to the impact of technology itself on the organisation.

As can be seen there are many definitions of what a business process is (Harrington, 1991; Davenport, 1993; Prasad, 1999). One final aspect to take into account when viewing a process is to view it as a system (Maull, Childe, Bennett, Weaver and Smart, 1995). Therefore an organisation can be looked at in terms of its business processes. A business process is not the same as a function as evidenced by McCormack and Johnston's definition. "The people and operations that are included in a single business process may come from more than one traditional functional group" (Childe, Smart, Weaver, 2006, p.3) or even a different organisation. A business process can be defined by who or what the final customer is (Maull et al., 1994). The fact that there is a final customer means that the process has a purpose and may actually be doing something that the final customer wants doing. Business process management has in recent years focused on the systems and on the supporting software for these systems (Neubauer, 2009; Shaw,Holland, Kawalek, Snowden and Warboys, 2007)

Each business process as a whole can be broken down into smaller components or sub processes. These processes can be examined to see if they add value (Porter, 1985) and if so how much from an external customer's perspective. Within each component there are decisions that control how and whether things are done. Interactions between components must be consistent with the perceived purpose of the whole process. The behaviour of

one component will affect all those components, which interact with it and can influence the ability of the process to fulfil its purpose.

Likewise the whole business process does not exist in isolation but is embedded in the environment with which it interacts; however boundaries may be drawn around a business process to distinguish it from its environment. "The boundary has to include within it the components where decisions are taken and components where decisions are implemented" (Gingele, Childe, Miles, 2002, p.238). The boundaries separating the business process from its environment will depend on two things, the purpose of the business process as perceived by the customer and the corresponding views of those individuals defining the business process.

The operation of the business process requires resources. These resources include both the physical requirements for the process and the human resource of the participants (Gingele, Childe and Miles, 2002, p.238). A business process has a degree of stability, which may be maintained by the commitment of the participants towards its purpose. The business process is thus seen as a purposeful system. In such a system the route to improving the efficiency and effectiveness is the way in which the human resources utilise the physical resources available (Checkland, 1982, pp.37-39). Therefore these systems or business processes as Checkland (1981, p.111) remarked, "...represent human activity systems, which have a set of human activities linked together so that whole constitutes a purposeful activity."

For the purpose of this research, a process is seen as a complex dynamic system, with a specific ordering of work activities across time and space, with a beginning and an end. This definition builds on the work of Davenport, Prasad and Checkland as discussed. The section has thus built on the concept of process and created a definition that will be used throughout this research. The definition adopted being that "a process is seen as a complex dynamic system, with a specific ordering of work activities across time and space, with a beginning and an end". In the next strand of literature, technology is introduced. This second strand will, in conjunction with the first

strand of procurement, form the background for the research questions. In this next section the background and broad definitions of technology are explored.

2.5 Background to and Definitions of Technology

Information management can be defined as the ways in which individuals from groups and organisations accumulate access, assimilate, store, process communicate, protect and apply information and knowledge.

It is important to emphasise at the outset that information management is not only a question of computer systems and Information and Communication Technologies (ICTs). Whilst it is true that most organisations rely on ICTs to support many of their information processes, there is also a large amount of information and knowledge that is not captured by or represented in these computer based information systems.

“... Evidence from research conducted from the 1960’s show that most managers don’t rely on computer based information to make decisions. The results of the studies are remarkably consistent: managers get two thirds of their information from face to face or telephone conversations; they acquire the remaining third from documents, most of which come from outside the organisation and aren’t on the computer system” (Davenport, 1994, p.121).

Davenport (1994, p.122) identifies ‘The Information Facts of life’ as

- “most of the information in organisations – and most of the information people really care about – is not on computers
- managers prefer to get information from people rather than computers; people add value to raw information by interpreting it and adding context
- the more complex and detailed an information management approach, the less likely it is to change anyone’s behaviour
- all information does not have to be common; an element of flexibility and disorder is desirable

- the more an organisation knows and cares about its core business area, the less likely employees will be to agree on a common definition of it
- if information is power and money people will not share it easily
- the willingness of individuals to use a specified information format is directly proportional to how much they have participated in defining it or trust others to do it
- to make the most of electronic communications employees must first learn to communicate face to face
- since people are important sources and integrators of information any maps or models of information should include people
- there is no such thing as information overload, if information is really useful, our appetite for it is insatiable”

Some types of information are easily expressed in written form, for example stock lists, orders or as numerical information such as purchases. These are codified forms of information. Other forms of information are less easily codified such as how to build a relationship with a supplier. Such tasks are non-programmable or non-routine – they require experience, judgement, knack, wisdom, and intuition. Michael Polanyi (1958) called this form of knowledge, tacit knowledge – it is adopted by people over time and can be difficult to convey to another person by any means for example language, numbers or other codes. This type of knowledge is generally acquired through experience and often through a process of trial and error.

Quintas, Lefrere and Jones (1997, p. 389) state that “codifiable knowledge can be expressed and transferred in written and other recorded forms (manuals, designs, specifications etc), tacit knowledge resides within people and may be embedded in personal skills and organisational routines and processes.” Because it is difficult to express in any code, tacit knowledge is difficult to represent in computer systems. However this tacit knowledge is often displayed through the enactment of routines and procedures within organisations.

Stenmark (2002) suggests that knowledge and information are two ends of a continuum. Alavi and Leidner (2001, pp.108-109) suggest that the difference between information and knowledge management systems is such that it only shows up in the attitude towards and the purpose of the systems. Stenmark (2002, p.4) suggests “whereas an information system processes information without engaging the users, a system for knowledge management must be geared towards helping the users to understand and assign meaning to the information, thereby including the user perspective”. This difference in systems is indicative of the many definitions of information and knowledge (Davenport, 1994; Nonaka and Takeuchi, 1995; Davenport and Prusak, 1998)

Writing in 1977, JR Galbraith suggested that all organisations could be considered information processing systems. Even the simplest organisation can only function and achieve its objectives if there is an existing knowledge base, knowledge about how to apply that knowledge base and the ability to acquire new information.

This awareness has led to the conclusion that information as well as traditional factors of land, labour and capital also creates wealth. Peter Drucker (1985) drew our attention to the fact that knowledge is the only meaningful economic resource. However Michael Porter and Victor Millar (1985) make the point that industries vary in the extent to which they are information intensive, in terms of both the information content of the product and the information content of the internal processes of the organisation. Moreover the types of information deemed important depend on individuals’ perspectives.

Peter Drucker (1985, p.58) writes that

“...Enterprises are paid to create wealth, not control costs. But that obvious fact is not reflected in traditional accountancy measurements. First year accounting students are taught that the balance sheet portrays the liquidation value of the enterprise and provides creditors with worst-case information. But enterprises are not normally run to be

liquidated. They have to be managed as going concerns that is for wealth creation. To do that requires information that enables executives to make informed judgements. It requires four sets of diagnostic tools: foundation information, productivity information, competence information and information about the allocation of scarce resources.”

Drucker further informs us that these “four kinds of information tell only about the current business. They inform and direct tactics. For strategy, organisations need to organise information about markets, customers and non customers and about technology in their own industry” (1995, p.61).

Clearly organisations cannot function without managing their information processes effectively. Information is taken in, assimilated and applied, the organisation adds value to its raw materials by using information to change or transform it. Within the organisation, in addition to knowledge being held in the heads of the workforce, much knowledge is embedded in tools and machines as well as being captured and represented in organisational processes and routines. This knowledge may be implicit (Nonaka, 1994) or tacit (Polanyi, 1958). Information Communication Technologies (ICTs) are tools and systems that support information processes and information management in organisations. They are not the only means by which individuals and organisations access, assimilate, communicate and apply information, nor can they support all aspects of information management, but there is no question that they have become increasingly important in all sectors of the economy.

Michael Earl (1994) characterised the first 30 years of the application of computer technology as the DP (data processing) era and the second period, which in Earls model is still current, as the IT (information technology era). Ward, Griffiths and Whitmore (1990) developed a model that distinguishes 3 periods: a DP era, a management information systems (MIS) era and a strategic information systems (SIS) era. In both cases these writers focused on the use to which the systems are directed. Their models and analyses

were not focused on different eras of hardware technology. In Ward et al's model for example the DP era was characterised by IT being used to improve organisational efficiency by means of automating manual back office data processing functions. In the MIS era the prime objective is to increase the effectiveness of management by improving information flows and transfers. In the SIS era the principal objective is to enhance the competitiveness of the user organisation through the application of it to business processes.

Press (1993, pp. 27-28) remarked "today's computers are sold by organisations like Apple, IBM and others but researchers had developed the ideas by the mid 1970's. Early computers were expensive, so it was important they not sit idle. Programs and data were prepared off-line and fed to the computer in batches by operators." After a job ran, the output was returned to the user. As recently as the early 1990's, batch processing was still being used for many organisations. Press went further and outlined the development of the computing paradigm as beginning in the 1950's with batch processing, in the 1960's timesharing became common, in the 1980's the desktop computer became common place and it was only in the 1990's that portable computers came into mainstream usage. Parallel to this development was the communication paradigm, again beginning in the 1950's with the transmission of batches of jobs, through to the development of interactive terminals in the 1960's, with finally the development of networks, local area networks in the 1980's, and wide area networks in the 1990's.

Because ICTs have been developing so quickly, managers need to continuously revise the ways in which they think about computers and communication systems. For example, Myers (1998) describes how the human computer interaction has changed substantially in the same period. From the 1960's where there was the development of direct manipulation of graphical objects such as used in Sketchpad, to the 1990's where virtual realities have been developed. Even in this period significant changes have occurred in the ways that people think about and use desktop IT. Whereas the first Personal Computers (PCs) introduced into organisations were used as isolated machines for writing (word processors), for storing, processing and

analysing data (small databases and spreadsheets), in many organisation's PCs are now networked (the development of the LAN and WAN (Press, '93). The user is now able to communicate with and transfer information between their PC and those of their colleagues in the organisation (wherever they may be located) and opens up the possibility for information accessing and transfer to and from external sources, including suppliers and customers. There has, as a result, been a major change in the way we need to think about PCs, even over their short history. Whereas in the mid 1980's the PCs were thought of as 'stand-alone' tools that supported individual activity, such as writing or data analysis, the PC must now be thought of as a communication device that enables people to link their desk-top to organisation-wide and external information sources.

"Management focused on operational efficiencies and the reduction of labour content of work in the 1950's and 1960's" (Cortada, 2007, p.33). He remarks, "what was then observed was that the application of IT was in the automation of many work practices. In the 1980's and 1990's the application of IT was about redesigning old processes for efficiency." The most pervasive growth though has been in communication across functions. Cortada describes the growth in supply chains and how they have taken on board the elements of speed, technology, and adaptability, which are only made possible by extending the uses of ICT. As a result, today managers increasingly are seeing the organisation as a set of interchangeable components made up of people, processes and IT. As both Press and Cortada observed this is occurring at the same time that both computing and telecommunications are expanding and transforming the value of employees. These employees are then capable of joining other firms or operating their own in the rapidly emerging 'value chains' of work (Cortado, 2007, p.34).

Patterns of use are therefore inextricably linked to the characteristics of the technology at any given period in time. With increased computer power, data storage and network capacity, the type of information that can be shared is also changing. It is possible to access graphics, sounds and moving images from sources around the world. Sharing this type of information across

electronic networks enables new types of work organisation to emerge. It is worth bearing in mind when reading historical accounts of computer applications that the cost of computer hardware fell consistently and dramatically from the mid 1950s; for example, hardware costs fell by 75 per cent between 1953 and 1964 (Lecht 1977, p.10). This enabled more and more organisations to introduce new systems. Nevertheless the computer, which did a great deal towards the wider uptake of IT, the IBM 360 was a significant investment costing \$700,000 to purchase in 1964, at 1964 prices. This price included the IBM 360 operating systems software but not the applications software. The cost of the software has not fallen as dramatically. As an illustration of the escalating cost of software and the problems encountered in trying to develop larger and more complex programs, it is worth noting that the early 1960's development of the operating software system for the IBM 360 computer is reported to have represented over 500 person years effort and cost IBM the same as the 360 series hardware development at over \$50 million, at 1960 prices (Friedman and Carnford, 1989).

Organisations particularly in industrialised nations are experiencing a huge growth in the use of information systems and technology (Bloomfield, Coombs, Knights, and Littler, 1997; Earl and Khan, 2001). Fletcher (1991, p.219) defined Information Technology (IT) as the acquisition, processing, storage and dissemination of vocal, pictorial, textual and numeric information by microelectronics-based combination of computing and telecommunications.

Weill (1992) defined IT as including all hardware, software, communications, and telephone and facsimile facilities. In a more specific example De Boer et al. (2002, p.26) defined Electronic procurement as using Internet Technology in the purchasing process – excluding old applications like ordering by telephone or by fax.

Information technology should be viewed as the whole system rather than as separate technologies (Brady 2003). As Brady (2003, p.128) points out "...the

trend in isolating and researching IT's individually ignores the collective and cumulative impact of IT, which a holistic view provides." It is worth noting that IT is viewed by managers in clusters (for example sets of systems including Enterprise Resource Planning (ERP) and Business Analysis tools or an ERP system with the addition of an Inventory Simulation tool).

It has already been recounted that Ward et al. (1990) developed a model that distinguishes three periods: a data processing era, a management information systems era and a strategic information systems era. The model is focused not on the different eras of hardware technology but rather on the use that systems are directed to. In looking internally at the organisation Nolan's (1979) six stages model suggests how an organisation follows distinctive stages of growth. This growth is related to the different types of applications being used. In this later version of his model, (see Figure 5, page 54) Nolan identified a major change in the management of organisation's data processing function as a shift from the management of the computer to the management of the organisations data resources. The danger with this model as Friedman and Carnford (1989, pp. 33-34) noted, is the problem of tenses, organisations are unclear as to whether something has already been done or whether it is merely thought about. This raises concerns when using the model to assess where an organisation is. Nolan also identified that organisations sometimes had an inability to take a step up post integration of systems. This is seen in the splitting of the growth (the tapering budget line) as illustrated in Figure 5. Post integration many organisations do not make further investment and as such the return on the work carried out previously was not realised and they did not realise the full potential of the systems they had invested in.

Further work has been carried out by Barras (1986) in his studies of changing patterns of IT in service sector organisations. He characterises these changes as representing three types of innovation, improved efficiency, improved quality and new or improved services. The key point of this model is that IT was initially introduced to automate manual back office functions, improve efficiency and reduce costs of internal processes. As gains in efficiency were

achieved, its use became directed towards improving the effectiveness and quality of existing service activities, such as speed of response or the availability of on-line services. The third type of IT use features the development of wholly new services available to the customers and users of the organisation.

Zuboff (1988) suggested a three stage framework model, that of automation, information and transformation. She described Automation as linking to the viewpoint that IT since its development has been seen to primarily automate previously manual systems and has been used extensively for routine and tactical activities to improve efficiency. Information provides increased effectiveness and moves the IT development processes to a higher level of benefit. The transformational stage then defines an organisation with new operations and practices.

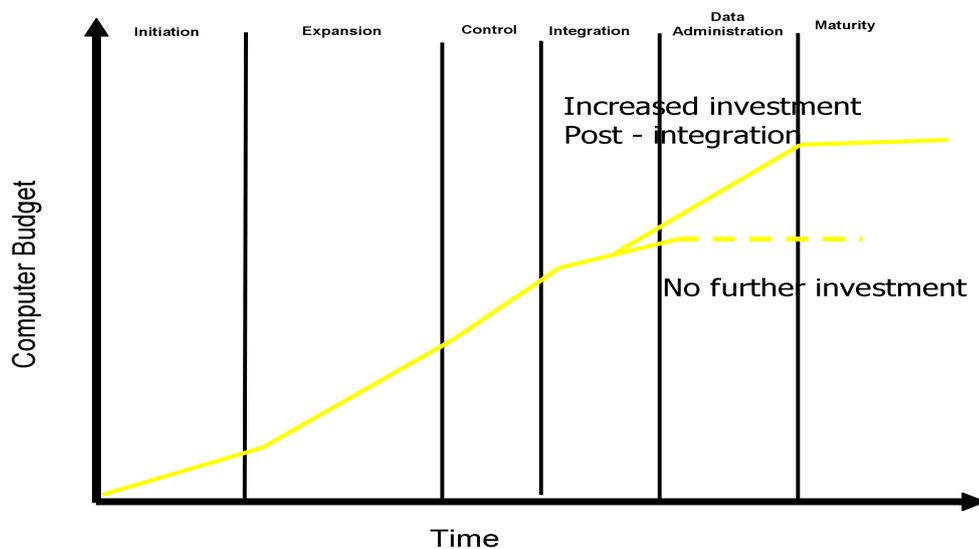


Figure 5 : Six Stage Process of IT Assimilation (adapted from Nolan, 1979)

Gardner and Ash (2003, p.19) noted that during the 1980's and 1990's "...the dominant approaches to planned change were premised on the assumption that structures, processes, technology and human skills, capabilities and

knowledge can be reconfigured to support or optimise the achievement of identified strategic goals” including Total Quality Management (TQM), Business Process Reengineering (BPR) and various forms of strategic IT interventions including ERP and e-commerce systems.

De Boer et al.'s (2002) conceptual model for assessing the impact of electronic procurement (EP) gives an indication of how one element of IT that of electronic procurement, impacts on costs. De Boer notes that, the impact of implementing a form of EP in an organisation may apply to four areas namely, organisation, IT, cultural and financial.

Kallinikos (2004) described how the module ‘vendor evaluation’ in SAP comprises the criteria for evaluating suppliers based on price, quality, delivery, general service and external service. He goes further and states that,

“the information about the suppliers recorded in the database is structured along these dimensions and the system provides, in addition, information about the past performance of suppliers. This way the system stipulates the steps ...which...must take place. ... It is in these respects that organisational-wide information systems move a step further in shaping human agency in organisations than traditional MIS or expert systems” (Kallinikos, 2004, p.10).

For the purpose of the research the definition of technology offered assumes that information technology should be viewed as the whole system rather than as separate technologies (Brady, 2003). This section has so far introduced the concepts of technology and as such shown how the development of technology has occurred. This has enabled a number of researchers (Nolan, 1979; Ward et al., 1990; Zuboff, 1988) to derive models of technology development. These models and the research into technology have enabled a definition that will allow for technology used in procurement to be investigated in this research. In the next section, the current technology being used in procurement is investigated, and the conceptual model for the procurement portfolio is introduced.

2.6 Technology for Procurement

The need for effective purchasing systems derives from having an environment requiring enterprises to demonstrate speed, innovation, cost, competitiveness and quality. Furthermore there has been a growth in importance to business competitiveness of strategies based on cost, product differentiation and customer focus. This has been further illustrated with the concept of lean supply as defined by Lamming (1996). “Lean production focuses on the elimination of all forms of waste including superfluous procedures (Lamming, 1996) from all stages of the production process ranging from the procurement of raw materials through to the end consumer” (Smith and Tranfield, 2005, p.40).

The above factors support the importance of Management Information Systems (MIS) as a support to decision making at the operational, tactical and strategic control levels within an organisation.

An MIS is defined by Lucey (1997, p.2) as,

“a system to convert data from internal and external sources into information and to communicate that information, in an appropriate form to managers at all levels in all functions to enable them to make timely and effective decisions for planning, directing and controlling the activities for which they are responsible”.

Harizanova (2003) describes the differing information requirements at different levels of the organisation (strategic, operational and tactical). This works builds on that of Lucey. At the operational level, information is provided through the transaction processing and reporting system that processes transactions, as they occur to update internal records and provide documents and reports. Information at this level will be scheduled, detailed, frequent, largely historic and narrowly focused. At the tactical level managers receive information collected from transaction processing systems or operational staff

and also from internal and external sources. This information will be utilised for planning and controlling activities and, where appropriate, transmitted in summarised form to senior management to support strategic planning.

At the strategic level, information from internal and external sources is required to enable top management to appraise organisational strengths, weaknesses, opportunities and threats. Information at this level will be unscheduled, summarised, infrequent, forward looking and wide ranging.

The tactical level highlights decision support (DSS) and group decision support systems (GDSS). The former enables the individual manager to make non-programmed, non-routine tactical decisions related to short duration, adaptive action-interaction realignments used to accomplish limited goals.

At the strategic level, information is used to make non-programmed, non-routine strategic decisions related to adaptations towards longer term, more broadly conceived ends.

Efficient management information systems enables management to plan, co-ordinate, organise and control (Harizanova, 2003). Especially in relation to transaction processing and reporting, some data processing may still be done manually. Applied to purchasing, however, manual systems of obtaining, processing, storing and retrieving information have been largely superseded by information technology. Lysons and Farrington (2006, p.184) point out

“In many organisations paperwork often serves merely to document a chain of events or to provide a logistical paper trail. Leading edge purchasing organisations need to transform this administrative function into a value added process by reducing, eliminating, or combining steps whenever possible.”

Manual systems tend to result in multiple copies of the same document being circulated and retained by different people. It has been found that considerable effort is devoted to the maintenance of information on purchase

record files, with a number of purchases order and ancillary files being maintained in different locations all of which must be kept up to date.

In multi-site organisations there may be a lack of cross-flow of information between plants regarding suppliers of common items thus preventing –

- consolidation of orders
- centralised purchasing
- recognition of potential spends with suppliers which could well result in negotiated group discounts
- partnership sourcing.

Furthermore research has shown inadequate group stock information leads to further purchases being made when surplus stocks at locations other than the user site could be utilised.

With the large volume of information relating to suppliers now available it can make it impractical to analyse, report and act upon data relating to

- supplier performance
- inventory
- standardisation, especially specifications, quality and nomenclature.

Killen and Kamauff (1995) go further by illustrating that although feasible, applications such as materials requirement's planning and optimised production technology would be impractical if only manual systems were available. It should be remembered, however that most forms and reports now computerised, were at some time manually processed and produced as described previously.

There is a clear need for information technology (Brenner and Hamm, 1996) for purchasing. In Brenner and Hamms (1996) research they identified six main shortcomings of information technology :

- “Isolated alignment of functional and operational buying requirements,
- No assistance of process flow of documents,

- Processing restricted to structured data, such as price and quantity,
- Focusing on automating internal activities instead of making use of supply market possibilities,
- No assistance of group work, i.e. neglecting a two way information exchange or face to face communication,
- Insufficient assistance of business to business communication” (1996, p.214).

Information technology Portfolio for Purchasing

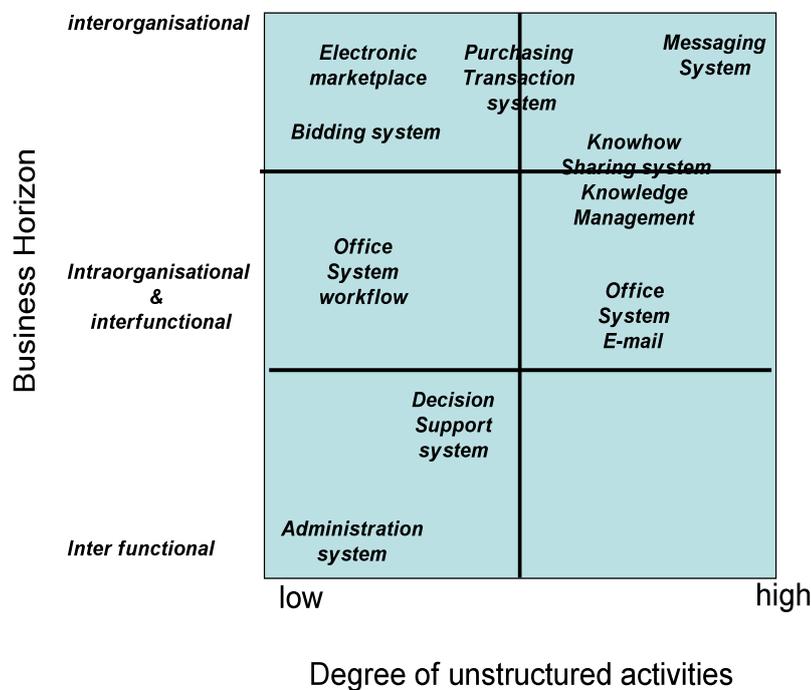


Figure 6 : Information Technology Portfolio for Purchasing (from Brenner and Hamm, 1996, p.217)

Brenner and Hamm (1996) followed further by classifying technology for purchasing by the variables ‘business horizon” and “degree of structure of problem and activities”. Figure 6 illustrates their findings. Brenner and Hamm went further in identifying that the current technologies are based on a Tayloristic viewpoint of processing data and functional working. As purchasing moves to operate in a process environment, where there is a

preponderance of unstructured activities, or more so in a value chain context where there is a high dependency on other external links outside of the organisation, new ways of looking at technology become critical.

This section has investigated some of the technologies used in procurement today. It has seen that there are still a lot of traditional approaches being used to manage the procurement process, and that automation is still the predominant way of implementing technology for procurement. Brenner and Hamm's model of examining the technology portfolio has enabled an initial classification of technologies used. Having introduced the concepts of functional and organisational in the next section the third strand of research structure is examined. This allows for the research area of structuration to be explored in detail.

2.7 Business process development

In Section 2.4 a process was defined as being a complex dynamic system, with a specific ordering of work activities across time and space, with a beginning and an end. In the early 1990's building on the definitions of business process, Hammer and Champy (1993) and Davenport (1993) put forward a business process perspective on organisational work. Traditionally organisations have in their development efforts focused on their internal activities at the expense of focusing on their environment. In different approaches for organisational development such as Total Quality Management – TQM (Harrington, 1991), BPR and Process Management, there was an emphasis on horizontal work processes combined with a customer focus. Common to all these approaches is that they focus on business processes in order to facilitate the value creation and need satisfying of the customers or clients of the organisation.

Lind and Goldkuhl (2005a) when examining the business process literature found that the determination of business processes and the criteria for such determination was an important problem. "How is a business process

constituted? How can a process be delimited and divided? These were issues [in the early stages of process research that had not been] resolved practically or theoretically” (Lind and Golkuhl, 2005a, p.5). More recently Goldkuhl and Lind (2008) have focused on trying to get a coherent perspective on business processes. The traditional focus has been on the transformative process, with the second view being the coordinative.

Davenport (1993) claimed that there was a healthy debate about the number of processes that were appropriate for any given organisation. He went further and stated that

“The difficulty derives from the fact that processes are almost infinitely divisible... the activities involved taking and fulfilling a customer order, for example can be viewed as one process or hundreds. The appropriate number of processes has been pegged out from two to more than one hundred” (Davenport, 1993, pp.27-28).

Keen and Knapp (1996) identified that there are two conflicting families of theories in discussing business processes. Lind and Goldkuhl (2005a, p6) described, “the predominant view regarded a business process as a phenomenon that takes one or more inputs and transforms these to an output that is of value to the customer.” This view it seems is discussed in much of the literature surrounding business process reengineering. It comes from the literature describing Total Quality Management (TQM). It can be viewed as a traditional industrial or manufacturing approach to business processes (for example Harrington, 1991). Childe et al. (1994) note that many organisations see BPR purely as an extension of TQM. In their view TQM is also seen as an extremely useful technique for focusing on the internal and external customer. They conclude that TQM programs are usually associated with continuous improvement efforts and thus may represent a necessary but insufficient condition for a successful BPR program.

There is a contrasting view to the previous view of transformation on business processes. This is the coordinative / communicative view based on the language / action oriented theories, for example Winograd and Flores (1986).

Winograd and Flores base their work on the speech act theory of Searle (1969). This process view, centres on the premise that communication is not just the transfer of information, but that when communication takes place there is also an action. There exist several process-oriented approaches for business modelling (Medina-Mora, Winograd and Flore, 1992; Dietz, 1999) based on the language action perspective. These are set against the transformative view of business processes. In the language / action process view, the management of commitments is emphasised for example in making a request or offer there is a commitment to act.

Lind and Goldkuhl (2005a) adopted a contrasting approach to develop a new business process view. They set on opposite sides of the spectrum the transformative view and the communicative view. They showed that

“The transformative view of business processes was regarded as the thesis in this dialectical approach. Important strengths of the transformative view on business processes were the focus on activity chains, value-adding activities and on customers. Weaknesses were a nearly total dissociation of coordination and communication. A communicative view on business processes was regarded as an antithesis in relation to the transformative view. Strengths in the communicative view on business processes were a focus on communication as a background. However one main weakness was a total dissociation of material acts” (2005a, p.6)

Further work by Lind and Goldkuhl (2005b) concluded that

- “there was a need to separate work performed in the organisation
- processes could not exclusively be regarded as either transformation or communication: transformation needs to be regarded in a coordination context
- processes could be exclusively regarded as sequentially related sub-processes: there exist variants of processes consisting of sequentially related sub-processes

- a one-sided focus on the customer was not enough, there was also a need to focus on suppliers and other parties related to the business
- An asymmetric view on customer satisfaction was not enough. There was a need to acknowledge reciprocal relationships between customer and supplier and mutual satisfaction of both parties” (2005b, p.7).

The development of the literature on processes has gone from being purely transactional and viewing them as transformative, to having complex co-ordination patterns, or routines, which were dependant upon enactment by actors, either through speech acts or some form of communication. In the next section, the procurement process is examined in particular.

2.8 The Procurement Process

Traditionally purchasing was managed as a three-stage process (Lysons and Farrington, 2006). This was the Identification Phase, the Ordering Phase and the Post-ordering Phase. The inefficiencies of these traditional procedures included

- “A sequence of non-value adding clerical activities
- Excessive documentation
- Excessive time in processing orders both internally and externally
- Excessive cost on purely clerical work” (Lysons and Farrington, 2006, p.184).

With Porter’s (1985) Value Chain, came a questioning of what value adding activities needed to be accomplished and more importantly how did they need to be done. Reck and Longs (1988) purchasing development model (included in Table 1, page 36) suggested that this traditional three-step model of purchasing approach was in what they defined as the passive phase. Yet the development of supplier relationships and the movement of focus being to external performance indicators (Harwick,1997) suggested that a more process oriented view of purchasing needed to be adopted.

Broadening out the traditional role of purchasing meant adopting new terms. Procurement is now seen as the process that includes all activities required to get an item (be it a product or service) from the supplier to the final destination e.g. customer (Brenner and Hamm, 1996, p.212; Van Weele, 2004). This encompasses the traditional purchasing steps but also very clearly encompasses the roles of supply management. Figure 4 (page 39) illustrates this very clearly.

Van Weele (2004, p.12), defines it specifically as ‘...obtaining from external sources all goods, services, capabilities and knowledge where necessary for running, maintaining and managing the company’s primary and support activities at the most favourable conditions.’ Further definitions can be found in the literature, and Table 3 (Novak and Simco, 1991; Archer and Yuan, 1995; Gershon, 1999; Van Weele, 2004; Caldwell, Bakker, and Read, 2007) illustrates some commonality in the models found to-date that have been reviewed as part of this thesis.

Procurement then (as defined by the literature to date) is seen as including all the activities required in order to get the product from the supplier to the final destination. It encompasses the purchasing function, stores, traffic and transportation, incoming inspection and quality control and invoicing. Some organisations would also include salvage and environmental issues as well. Procurement spans the supply chain as defined and the management of procurement in a modern organisation encompasses logistics management as well.

<u>Novak and Simco (1991)</u>	<u>Gershon (1999)</u>	<u>Archer and Yuan (2000)</u>	<u>Van Weele (2004)</u>	<u>Caldwell et al (2007)</u>
Identify or re-evaluate needs	What is it that is wanted?	Information gathering (search for suppliers that can satisfy requirements)	Determine the specification of goods and services that need to be bought	Specification Phase
Define and evaluate user requirements Decide to make or buy – Identify type of purchase	How should the procurement of what is wanted be processed? What can the market provide?			
Conduct market analysis				
Identify all possible suppliers		Supplier contact (Request for quotes are advertised or direct contact made with suppliers)		
Pre-screen all suppliers		Background review (e.g. references are checked)		
Evaluate remaining supplier base Choose supplier		Negotiation	Identify most suitable suppliers Preparing and conducting negotiations	Selection Phase Contracting Phase
Deliver product / perform service	Making the purchase	Fulfilment	Placing an order with selected supplier	Ordering
Post-purchase / make performance evaluation	Achieving the desired Outcome	Consumption, maintenance and disposal (evaluation of performance)	Monitor and control the order	Expediting and Supplier Evaluation
		Renewal	After-care and evaluation	Follow up and procurement evaluation
	Ending the relationship			

Table 3 : Models of Procurement

There can of course be a variety of ways that organisations can procure. Brenner and Hamm identified on the basis of a material portfolio (Figure 7) that there were two idealistic procurement processes that were utilised by organisations.

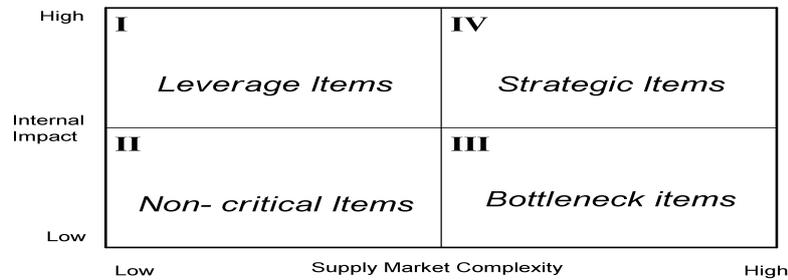


Figure 7 : Materials Portfolio (from Brenner and Hamm, 1996, p.212)

The process used for procuring leverage and non-critical items was termed product-oriented procurement process, while the second, used for bottleneck and strategic items, was called supplier-oriented process. It must be noted that these processes operated within the private sector and as such the model has not been applied to the public sector, where the procurement process varies from country to country (Caldwell et al., 2007). Within the European Union there are a number of processes at play (these are discussed in some detail in section 2.9). However for the sake of genericising the process, Gershon in 1999 applied a simplified model to the public sector in the UK. This is illustrated in Figure 8, page 67.

This view of the procurement process for the public sector is complicated by the lack of academic research (Thai, 2001). There has been an increase in the number of research papers in recent years in the area of public procurement (Morlacchi, Lamming and Wynstra, 2002; Zheng, Knight, Harland, Humby and James, 2007). In the main research has focused on e-procurement in both public and private sectors. The literature has been mostly concerned with the financial impact of e-procurement implementation

(McManus, 2002). A number of authors argue that internal processing costs and external contract prices can be reduced through; reduced work in process (Ellram & Zsidisin, 2002); minimised cycle-time (Osmonbekov, Bello and Gilliland, 2002; Lancioni, Smith and Olivia, 2000); electronic documentation (Ramusson, 1999); increased automation of process (Kalakota & Robinson, 2001; Croom, 2000; Deeter-Schemelz, Bizzari, Graham and Howdysshell, 2001); process re-design (Earl, 1994; Solomon, 1990); improved accuracy (Lancioni et al., 2000); economies of search (Evans & Wurster, 2001; Brandon-Jones and Croom, 2005); reduced maverick spending (De Boer et al., 2002); use of e-sourcing for lower value purchases (De Boer et al., 2002) and reduced transmission errors (Croom and Johnston, 2003). However all authors only deal with a single part of the procurement process, that of the transaction of buying, and do not encompass the whole process.

Procurement Process

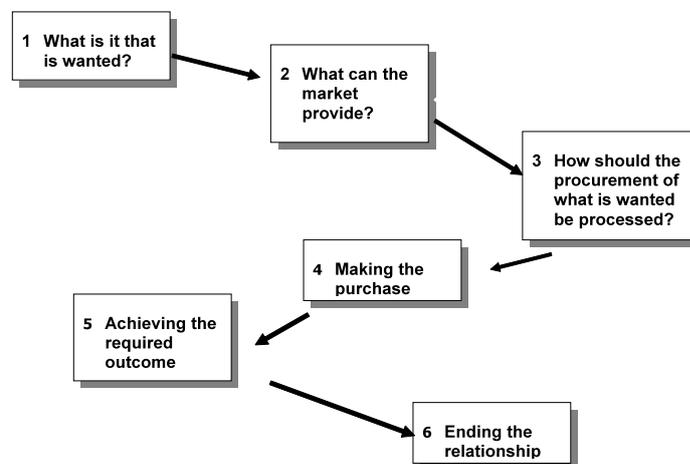


Figure 8 : The Public Procurement Process (adapted from Gershon, 1999)

Bryntse (1996) found that the purchasing process is a circular interactive purchasing process rather than being a sequential one. Bryntse further found that “the process of industrial purchasing is often illustrated in a sequential way, with defined stages from specification to a one point delivery. In the analysis of the purchasing of technical services, the process has been shown

to be dynamic, continuous and interactive” (1996, p.198). According to Bryntse it seems to be more appropriate to illustrate the purchasing process (and in particular that of purchasing services) as a network or a circular process.

Bryntse (1996, p.199) found that some aspects were seen to be more relevant for managing contracts for the provision of public services. The management of flexibility and timing needed to be monitored and controlled. Because services are consumed at the point of contact, there was a need to consider the customer. Again because of this instant consumption and the fact that services cannot be stored, there was no need to consider inventory or any of the associated issues with inventory. Instead there is a increased need to manage the flexibility of the delivery of the services especially with respect to to the timing of that delivery.

According to the findings of the Byrntse’s (1996, p.199) empirical research there is a group of actors involved in the purchasing process. What seemed to evolve from the research was the need for “a project approach for the sourcing and specification issues and a contract management team for managing the service delivery process” (1996, p.199).

Stinchcombe (1990) argued that structures resemble a quasi hierarchy when examining contracts of uncertainty. Byrntse found that the interpretation of the structures as a combination network and hierarchies resembled Stinchcombes conclusions.

Purchasing in the public sector can be regarded as having an institutional aspect (Zenz, 1994, p.33). Byrntse (1996, p.200) concluded that

“the purchasing function could be seen as part of an institutional system, where the conditions set out in the contracts correspond to a high degree of standards pursued by government agencies, industry associations and professional associations. The institutional aspect can be argued to be of special importance in a service context, since there

is a special need for common understanding of the intangible properties and the difficulty of measuring results and outputs.”

Work on the broad procurement process and the role that technology plays in that process does not exist within the public sector research. Procurement seen as a process that is set within an institution, in particular one as bounded as the public sector, is critical to giving the process the characteristics of a structure. Although Bryntse (1996) argues that this institutional aspect is important in a service context, it will be argued in this research that this is especially important in the public sector and is not limited by either product or service. In the next section, the differences between public and private sector procurement are explored. This section develops the theme of public sector procurement, one of the major themes for research in this thesis.

2.9 Public Sector vs. Private Sector Procurement

The public and private sector purchasing environments are seen to be different (Lian and Laing, 2004, pp.247-248). Procurement differs in a number of ways between the public sector and the private sector, the most important being that it is more highly regulated and politically constrained than the private sector (Ferlie, 1992; Boyett, Robinson, Brown, Finlay, 1996; Bryntse, 1996). Van Weele (2004, p. 350) goes further and states that

“the purchasing decision making is often intertwined with political objectives and issues. Secondly, the budget system used within Public Sector bodies does not provide sufficient incentives for budget holders to actively strive for the best value for money. Usually budgets should be spent in the year they have been assigned. Thirdly most countries still favour a nationalist and protectionist approach when it comes to placing orders of supplies. In most cases, local suppliers are favoured for a variety of reasons.”

The EU and Irish Governments have published various purchasing guidance documents¹. The respective authorities be they national or European have promoted a public procurement policy of fair and open competition. This has been seen to date as the best way to attain an efficient and effective public procurement sector.

Bovis (1996), in his review of the Small and Medium Sized Enterprises in the United Kingdom and the Republic of Ireland, 1996, found that their share in the Public Sector market was only 15.3% of all enterprises, yet they were responsible for almost two thirds of the EU annual turnover and accounted for 95% of the total number of enterprises. These two statements seem contradictory and indicate that research in this area has not provided definitive answers as to who is competing and winning Public Sector Contracts nor how they compete for these contracts.

In answer to this dilemma, the introduction of EU Directives, i.e. legislation, has been intended to foster a more uniform and consistent approach to purchasing decisions making within the EU countries.

Bovis stated that the aim of the directives was transparency and improved market conditions. They were based on three underlying principles

- Community wide advertising of public contracts above certain size thresholds
- Prohibition of technical specifications capable of discriminating against particular bidders
- The application of objective criteria for participation in tendering.

In the main public purchasing serves the public interest. Public sector organisations manage the interface between public and private sectors and spend or influence the spending of public funds. They share many features in

¹ http://www.e-tenders.gov.ie/guides/guides_list.aspx?Type=61 (last date accessed 11/11/07)

common with large private sector purchasing and supply operations. However there are features that differentiate public from private sector.

Public procurement represents a relatively stable market. Bovis (1996) went further to explain that the stability of the public sector and in particular public procurement could be regarded as a major advantage. In particular this gives rise to the ability to create frameworks and policy that have long-term effects. He concluded that if framework and policy could be built that allowed long term planning and decision making then this could encourage and even suit regional development. Furthermore that these types of structures could lead to the development of decentralised decision making which sit under centralised policy making. This would be the final result of a structured public procurement sector.

Bovis's comments on public sector development in the European Union are important for understanding the development of the bounded process. More importantly the role of procurement as a policy tool distinguishes it from the private sector. It is not just an implementation of directives nor is it the application of a set of rules. It is a broad process that examines the marketplace, reconciles the demands of the users including the policy makers and tries to implement these demands through the procurement of goods and services. Models of procurement that exist tend to focus on the transactional elements and not to place them in any context.

Zenz (1994, pp.33-34) took a comparison of Private Sector Procurement and Public Sector Procurement and outlined a number of key differences. These included

- Source of Activity; authorisation for government / public procurement is derived from law; in Europe this is seen as the EU Public Procurement Directives which have been mentioned previously. Therefore there is public accountability for a public sector employee. By contrast, the private industrial procurement official has no responsibility beyond that to the corporate executives they report to.

- Legal Restrictions: Although Zenz looked at Federal law, as does Dobler and Burt, (1996), restrictions in the EU are equally applicable. The regulations are designed to prevent personal favouritism on the part of the Public official and to assure all qualified vendors of equal opportunity.
- Freedom of Information: All public purchasing records are open to scrutiny by interested parties. Although specific prices may not always be indicated, except that of the winning bid, the price range and number of bidders is generally available.
- Absence of Interest Cost: In private purchasing one of the considerations determining the size of the reserve inventory of material and supplies is the total cost of maintaining that inventory. In public procurement, not much thought is usually given to the cost of carrying inventory. In public procurement the major considerations are still, the favourableness of the quoted price and is there budgeted money available to pay for the purchase?

There are other significant differences. These include a public agency purchases against a budget and must commit funds for each purchase made against that budget. The private counterpart buys against production schedules that have been established by other departments. The public buyer cannot promote reciprocity, whereas some private buyers see the expenditure from various points of view, including buying from customers. The private buyer regards sources of supply and price paid as trade secrets. By contrast, public buyers will readily exchange price and source information but private buyers do not.

The public sector as a whole varies in size and content in different countries. Each public sector department may also vary in size and content between countries. The Irish Public Sector accounts for about €9 billion (www.finfacts.ie, 2008), while in the UK the health sector alone is in excess of

€125 billion (OGC, 2008). Within each country each public sector has different features (Caldwell et al., 2007).

The co-ordination of the procedures for the award of public contracts is achieved through the implementation of the '*Public Procurement Directives*'. Price Waterhouse Coopers (2001, p.37) showed that

“there are separate directives governing the classical public sector and the utilities sector, the latter sector being permitted a higher level of flexibility in relation to procedures. The directives currently allow member states² to authorise the submission of tenders by electronic means, subject to certain conditions, but pose an obstacle to the exclusive use of electronic communications”

Focusing on Ireland more specifically, it can be seen that “Government Departments and other public bodies and utilities are responsible for ensuring that they comply appropriately with the wide range of legal obligations which apply to them” (go-source, 2004). These can include EC Treaty and other international obligations, such as the World Trade Organisation (WTO) Agreement as implemented in Irish legislation or by virtue of direct effect, EC Procurement Directives as implemented by Regulations made by the Department of Finance in Ireland, Government Guidelines and Contract and general commercial law. There can also be more specific guidelines introduced by each specific sector e.g. Local Government and Health. The Guidelines require that competitive tendering is to be used for all procurements within the public sector, unless exceptional circumstances apply.

² <http://www.ogc.gov.uk/procurement.asp> as an example (last date accessed 11/11/07)

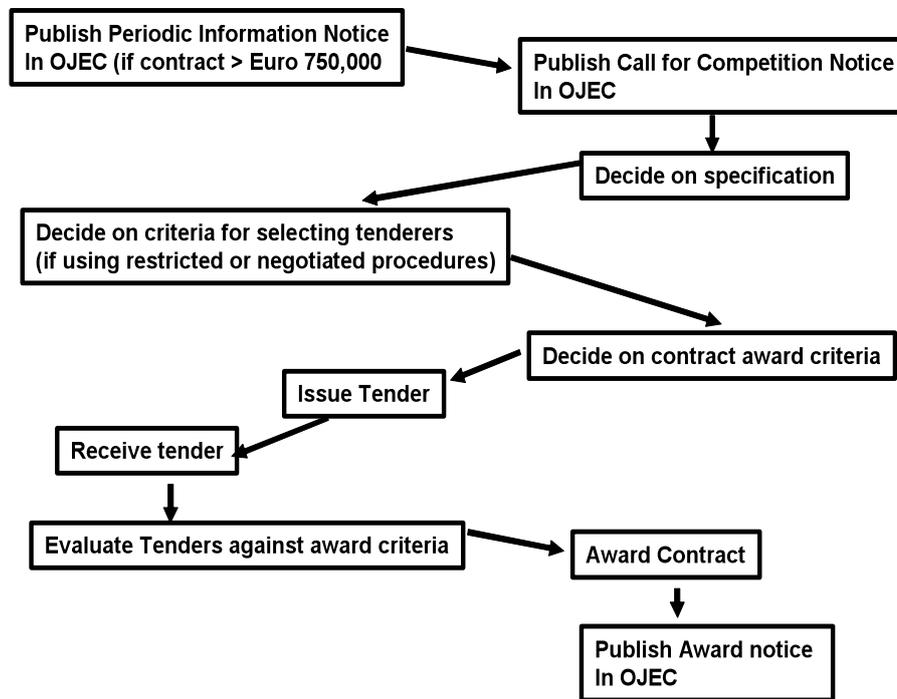


Figure 9 : Processes for Tendering under EU Rules

“All public bodies have a general responsibility for the efficient and effective use of resources. They are required to ensure that procurement strategies, procedures and responsibilities are clearly established and fully understood by all concerned” (go-source, 2004).

There are various EC Public Procurement Directives which apply to Ireland.³ The rules arising from the Directives provide for various procedures such as open or restricted tendering; specified timescales; published criteria for selection of candidates and published criteria for award of contract. It should be noted that most of the bodies have less formal rules for very small contracts (under €25,000 for example, but this can vary from organisation to organisation). A simple outline is given of the formal process required under EU rules in Figure 9)

³ http://www.e-tenders.gov.ie/guides/guides_list.aspx?Type=61 Item 2 as an example (last date accessed 11/11/07)

To date there have been three different types of "procedures" operated by public bodies in awarding contracts for supplies, works and services. These are known as the "open", "restricted" and "negotiated" procedures. More recently a new procedure called "competitive dialogue" has been introduced to give greater flexibility to the tender process. Table 4 gives an overview of each of these rules. It must be noted that these procedures only come into play after requirements gathering and market analysis has been done.

Zenz (1994, p.35) concludes that there are certain disadvantages to public procurement procedures, including

- liability to deviate from established procedures when time is important
- reluctance of suppliers to furnish technical advice and services since they cannot be assured of compensation for their efforts
- The inability to favour deserving suppliers who have performed exceptionally well.

<u>The Open Procedure</u>	<u>The Restricted Procedure</u>	<u>The Negotiated Procedure</u>	<u>The Competitive Dialogue</u>
<p>As the name implies, the Open Procedure means that any and every supplier wishing to participate in a tender process is entitled to receive tender documents and to submit a tender. This is a routine procedure. It is the most preferred procedure by the EU Commission. However, tenders may be invalidated unless they meet the set minimum financial, economic and technical standards set by the authority. The time limit at present for this procedure is 52 days from the date of dispatch of notice</p>	<p>This is a routine procedure whereby only those suppliers receiving tender invitations from the contracting authority may submit tenders. Selection for tender lists is based on meeting the quality standards of financial, economic and technical competence. These criteria are set by the authorities and announced in advance. In both the Open and Restricted Procedure all negotiations with tenderers on prices are ruled out. The time limit here for this is 37 days from date of dispatch of notice for receipt of request to participate.</p>	<p>The negotiated procedure can be used as standard for non-EU contracts. However, when used by public authorities for EU contracts this is an exceptional procedure. Participation is limited only to those suppliers who, having been consulted, are invited to negotiate the terms of a contract. Under the public procurement directives, the negotiated procedure may be used only in special circumstances. For this procedure the time limit here for this is 37 days from date of dispatch of notice for receipt of request to participate. Utilities operating in the water, energy and transport sectors routinely may use the negotiated procedure for relevant contracts</p>	<p>This is where a shortlist of candidates can be drawn up and further discussion can be had on what is required. This is now being used for the development of public private partnerships or the procurement of very complex systems.</p>

Table 4 : Overview of Procurement Procedures as set under EU Directives

There is a further area here to be debated, that of control within the public sector. This generally falls into two areas of structure that of centralisation and decentralisation. In examining organisations, and in particular the relationships between the corporate centre and the business units, two concepts commonly used are centralised and decentralised. Decentralisation is often associated with a pluralistic and loosely coupled organisation with a portfolio of standalone business units (Jarzabkowski, 2002). Jarzabkowski (2002, p.6) states “Greater centralisation is associated with the view of the organisation as an overarching carapace of core competences and identity, under which a set of synergistic departments are managed.” In the case of the Irish Health Sector, the objective of centralisation was to bring these core competences together.

Khandwalla (1973) says that competitive environments increase centralisation. This happens as organisations resort to management controls in order to improve co-ordination, monitor quality, and reduce costs. This can be especially true in diverse organisations with many business units, where management controls improve standardisation and create a unitary image (Khandwalla, 1973; Mintzberg, 1979). In the public sector, in particular in Europe, the term New Public Sector management has dominated public sector management in the last few years (Flynn, 1996; Pollitt and Summa, 1997). There are however three key dimensions as identified by Bach and Della Rocca (2000) underlying the management practices. They show that

”the first concerns the extent to which a stronger management function [which is held] accountable for performance has emerged. The second issue concerns changes in the organisational structures and the extent to which monolithic public service organisations are broken into separate units with more devolved management practices. The third element [they draw attention to is the development of a market orientation, whereby] the public sector management practice has shifted from management by hierarchy to management by contract” (2000, p.86)

These changes have been noted in not just the public sector abroad but also within the Irish context.

As shown, public sector procurement does not operate within a vacuum. With the changes that are occurring in both the private and public sectors it has been concluded that modern procurement is not about doing what an organisation already does better, it's about doing things differently. Besides the complexity of the procurement directives there are other more local environmental influences that affect the procurement process.

Harland, Gibbs and Sutton's (2000) conceptual model (Figure 10, page 79) for public sector supply, offered a framework for analysis at the top level of public procurement policy. It provided an opportunity to assess the drivers and factors that have influenced change in the public sector procurement arena. It can allow for the isolation of the technological factors. For the purpose of this research the isolation of technological factors is critical in establishing a link between the technology and the actions taken. Although Harland's model is designed for the UK public sector and in particular the health sector, it is worth noting at this stage that the model itself has not been tested in the Irish context. The construction of the model allows it only to be applied within a single jurisdiction.

However within public sector there are a number of different influences on supply networks and in particular the procurement process. The model is structured as likened to layers of an onion, each layer allowing the researcher to examine the context for supply strategies in the public sector. There is the outer layer analysing the macro environment, and the inner layer analysing the microenvironment. Areas of influence that affect the nature of the sector are the amount of regulation, the type of accountability, the stakeholder influence, the supply market factors, the competitive nature of the market and any other factors that may be governed by the nature of the sector.

Finally there is the identification of the sector specifically, the nature of the sector and the actions that are taken and influenced by both policy and

legislation i.e. Government action. The model is complex but allows a context to be drawn for the strategy being adopted by a sector.

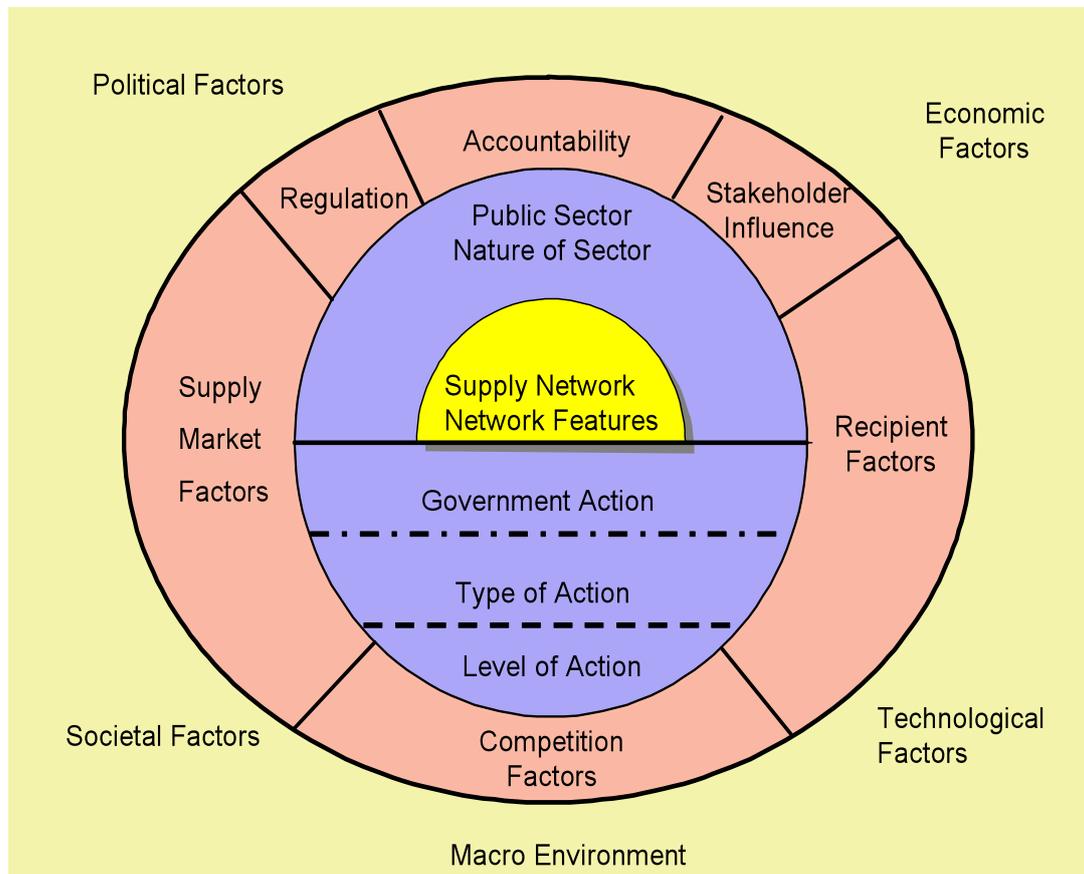


Figure 10 : Conceptual Model of Public Sector Supply (adapted from Harland et al., 2000, p.350)

As has been examined in this section, one of the key areas of influence is the European Union, be that in the regulations such as the Public Procurement Directives, or the geographical effect of the union itself. Other areas of influence occur at the national level, then sectoral level, and perhaps at agency and then organisational level. In this research it is assumed that the model is layered and that influences at each level can have a direct impact on the network that is being examined. In the case of this work this will be the procurement process itself.

2.10 Chapter Summary

This chapter identifies the knowledge and insight obtained from researching the current literature. The review has explored the themes of procurement and technology from their development as theoretical concepts to the current research issues that were relevant for this study. This chapter has highlighted the gaps in the literature to date.

In the next chapter the themes of the thesis are pulled together and the initial conceptual framework is presented. The formal research questions which set out the overall approach to the thesis, and which are linked to the research

The themes and research questions and finally the research objectives for this research have arisen from a number of areas. These have included the development of supply chain management, the role of purchasing in the supply chain, the development of interest in business processes; the role of technology and the use of structuration theory to examine the impact of technology. The main theme of the thesis is picked up here by building back up the definition of procurement from the supply chain and business process literature and defining it as a social system. Contrasting the public sector and private sector procurement regimes develops this further, which shows that the public is more tightly bounded and structured than the private sector. Finally these strands are joined together and the current gaps in the literature are outlined, the research questions and the research objectives are set out.

Chapter 3 Structure - development of the Conceptual Framework

3.1 Introduction

This Chapter sets out to develop the literature in the area of structures. In particular picking up the theme of technology, an alternative approach to researching the impact of IT is discussed, that of structuration. The theory of structuration is offered as an alternative to the traditional methods of examining structures. Structuration is chosen as a lens in which to examine the procurement process, as the theory enables the examination of social systems as constituted by human action. This approach is developed in Section 3.2. From Chapter 2 it is clear that context was an important element in examining the procurement process. Using structuration as a lens and holding that human action is enacted within the context of a pre-existing social structure, therefore, the actions that make up the procurement process can be partly predetermined based on the varying contextual rules under which the process occurs. This forms the basis for the discussion on structuration and how it can be used to examine the context for the procurement process. The research themes are drawn together from this discussion and from Chapter 2 and the development of the initial conceptual framework is presented. The framework was developed from the gaps in the literature in order to answer the research questions posed. The stages of development are then shown as the areas that need to be addressed and how they are interlinked. A description is finally given of the framework being proposed. This includes an outline of how the framework would be used in practice. The key question being addressed throughout is 'How does technology impact on the procurement process?'

3.2 Structures

Meláo and Pidd (2000, p.112) highlight four different perspectives on business processes and state that these business processes can be treated as

deterministic machines, as complex dynamic systems, as interacting feedback loops and as social constructs. Deterministic machines are characterised by a fixed sequence of activities, which are well defined. Dynamic systems combine people, tasks, structure and technology. Interacting feedback loops emphasise and extend the organic point of view of dynamic complex systems, but are in themselves a closed system. Finally social constructs try to show that business processes can be made and performed by people with different values, expectations and agendas.

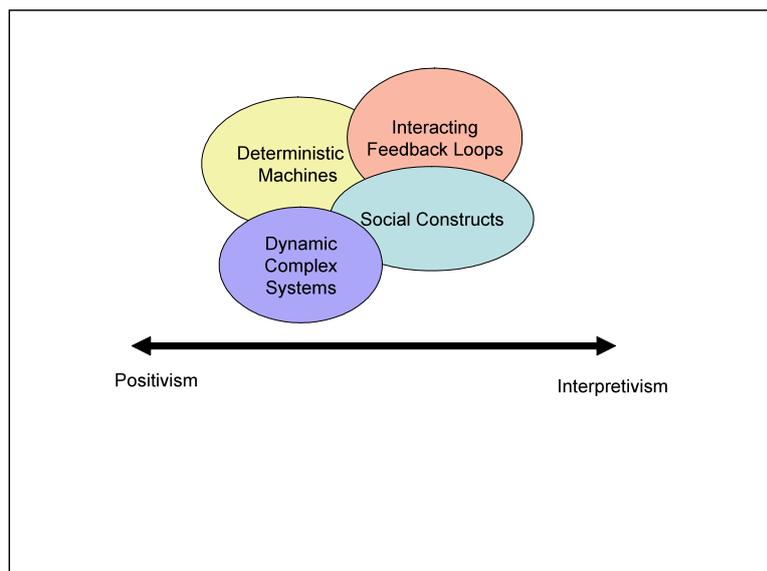


Figure 11 : Business Process vs. Philosophy (Meláo and Pidd, 2000, p.122)

These views can be represented on a continuum (Figure 11) and as Meláo and Pidd (p.122) state “are best shown as inter-related facets of a multifaceted reality”. Each of these approaches to business processes is shown to come with different philosophical assumptions about the nature of business processes. These different assumptions influence the perspective taken by the researcher in mapping them. In addressing the research and the process of procurement, the approach taken to map the process will have consequences for the epistemological viewpoint taken. It may also influence the data collection in the cases chosen.

Heintze and Bretschneider (2000, p. 801) explore whether restructuring in an organisation occurs after information technology implementation. They found

that information technology (IT) implementation has little influence on an agency's structure and where reform of the structures has taken place it has very little effect on performance. Their findings are important in the context that they examined public sector agencies, where restructuring may be limited due to the nature of the organisation. Unlike in the private sector where the implementation of IT should have a return on investment, be that in performance or a reduction in headcount, some re-organisation inevitably takes place.

3.3 Structuration

An alternate view of structure is of having no virtual existence, that is of having no "reality except as it is instantiated in activity" (Whittington, 1992, p.696). Dobson (2001, p.77) argues that social systems are made up of actions of human actors, facilitated and yet inhibited by the social structural properties of these systems. The rules, the guiding actions and the resources are defined by these structures. Dobson goes further and shows that while structural properties make action possible, structures themselves can have no reality except as they are enacted in activity or retained mentally as remembered practices or resources. Giddens (cited in Rose, 1999, p.2) also asserts that social systems can be said to exhibit structural properties when social practices replicate over stretches of time. Thus an organisation may be described as having structural properties.

Giddens (1984, p.66) adopts a particular, unconventional definition of structure "that exists only as structural properties. He argues that 'the causal effects of structural properties of human institutions are there simply because they are produced and reproduced in everyday actions' (Giddens and Pierson, 1998, p.82). Giddens notes that routine is "integral to the continuity of personality of the agent... and to the institutions of society. Predictable routines and encounters provide individuals with ontological security, which underpins their personal identity" (Giddens, 1984, p.60).

Table 5 summarises Giddens account of structurations empirical relevance and describes some possible implications for technology researchers.

	Key Feature	Implication for Technology Research
1	All human beings are knowledgeable agents	Researchers should consider social actors as being highly knowledgeable about what they do and as actively involved in the enactment of social practices
2	The knowledgeability of human agents is always bounded on the one hand by the unconscious and on the other by the unacknowledged conditions and unintended consequences of action	Social actors understanding of their practices is necessarily limited, so researchers should consider their accounts as offering only a partial explanation of their actions, which needs to be supplemented by other evidence
3	The study of day to day life is integral to the analysis of the reproduction of institutionalised practices	If researchers want to understand large-scale phenomena that persist over time, they need to study the everyday practices of the relevant social actors that constitute them
4	Routine, psychologically linked to minimising of unconscious sources of anxiety, is the predominant form of day to day social activity	Most everyday social practices that researchers study are routinised, and hence stable over time, because this is psychologically reassuring for social actors
5	The study of context, or of the contextualisation of interactions, is inherent in the investigation of social reproduction	To understand how social practices are sustained over time, researchers need to study the particular setting in which they take place
6	Social identities, and the position-practice relations associated with them are 'markers' in the virtual time space of structure	Although structure is virtual its effects can be observed indirectly through its influence on the social roles that people play
7	No unitary meaning can be given to constraint in social analysis	A variety of different types of constraint may enable and restrict social actors in a particular setting
8	Among the properties of social systems, structural properties are particularly important, since they specify overall types of society	Different types of society are characterised by different structural properties
9	The study of power cannot be regarded as second order consideration in the social sciences	Accounts of social practices need to give particular attention to the operation of power relationships
10	There is no mechanism of social organisation or social reproduction identified by social analysts which lay actors cannot also get to know about and actively incorporate into what they do	People can always learn about social researchers accounts of how society works and may draw on these in their actions

Table 5 : Aspects of Structuration Theory (from Jones and Karsten, 2008, p.135)

Giddens is critical of those who have attempted to import structuration theory in total into the given area of study, preferring studies 'in which concepts, either from the logical framework of structuration theory, or other aspects of my writings, are used in a sparing and critical fashion' (Giddens in Bryant and Jary, 1990, p.213). Structural concepts can thus be seen as objects that

provide a clarification of the logic of research into human social activities and cultural products rather than a source of testable propositions.

Whittington however argues that an organisation's structural properties – the rules and conduct and allocation of resources – are drawn from the social systems in which their members participate. Whittington also highlights the misuse of Giddens by a variety of authors; in particular the lack of structure in the context of outside influences for example society. This is of particular relevance when looking at a process that is directly influenced by a larger contextual setting (for example national or even EU), as well as being open to public scrutiny (for example due to the fact that it is a public procurement process).

3.4 Structuration and Technology

Orlikowski (1992) extends structuration theory. She breaks away from the theory on two points. Firstly technologies may become embedded or routine through repeated use, however they continue to be modified after development and implementation is complete. Secondly, structures only come from the technologies from these embedded routines or repetitive actions. They are in a sense constructed through the recurrent use of technology.

"Technology is created and changed by human action, yet it is also used by humans to accomplish some action" (Orlokowski, 1992, p. 405). This idea of technology as a recurring structure is the first premise Orlikowski highlights. Orlikowski remarks that the second premise is a result of the first, that is that technology is interpretatively flexible, hence that the interaction between technology and organisations is a function of the different actors and contexts that were present in the development and use of the technology.

Orlikowski (1992, p.406) goes further and shows that the duality of technology demonstrates prior views of technology –either as an objective force or a socially constructed product – as a false partition. Technology is both the

product of human action, while it also assumes properties that are structural. In any social context actors physically construct technology. Actors through the different interpretations they associate with it and the various attributes they emphasise and use, construct technology. However Orlikowski posits it is the case that once the technology is developed and deployed, it tends to become structured and formally organised thus losing its connection with the human agents that constructed it or gave it meaning. The technology then becomes part of the objective, structural properties of the organisation.

Orlikowski (1992, p407) points out that with many types of technology the processes of development and use are often accomplished in different organisations. Many of the actions that makeup the technology are often separated in time and space from the actions that are a result of the technology itself. This time-space disconnects or breakdown between time and space is related to the notions of temporal scope. Rather than proposing design and use as disconnected moments or stages in a technology's lifecycle, the structurational model of technology proposes that the technologies themselves such as hardware or software as potentially changeable throughout their existence.

"Technologies are designed and used recursively" (Orlikowski, 1992, p.408). Users can change the design of technology. Where there is a greater level of interaction users during the initial phase of development of the technology, the ongoing potential for users to change the technology (both physically and socially) through their interaction cannot be dismissed. In using technology, users interpret, obtain and change it in various ways, being influenced by both individual and social factors. Orlikowski states (1992, p.408) that "despite these opportunities for engagement with technology, rigid and routinised views of and interactions with technology do develop. Such developments are a function of the interaction between technology and organisations and are not inherent in the nature of technology."

Orlikowski and Robey (1991 p.152) offers four key hypotheses

1. technology can be seen as a product of human action : technology is seen as an outcome of such human action as design, development, appropriation and modification
2. technology can be a medium of human action : technology facilitates and constrains human action through the provision of interpretative schemes, facilities and norms
3. there are institutional conditions of technology: institutional properties influence humans in their interaction with technology, for example, intentions, professional norms, state of the art in materials and knowledge, design standards and available resources (time, money, skills)
4. there are institutional consequences of interaction with technology: interaction with technology influences the institutional properties of an organisation through reinforcing or transforming structures of signification, domination and legitimisation

In the model of technology proposed by Orlikowski (1992), structuration is seen as a process, which is embedded historically and contextually. While the main parts and nature of the relationships underpinning this model of technology are considered relatively stable, their scope, content and relative power can vary over time. In addition, structuration is understood to be a dialectic process, thus it can appear to be contradictory. In contrast to other models of technology development that relate elements linearly, the structural model as proposed by Orlikowski (1992) assumes that all the parts react recurrently, that they may also be in opposition and that they may undermine each others effects. An example is the tendency of technology to become embedded in organisations thus becoming detached from the human action that constructed it (Kallinikos's (2004) remarks on the nature of loss of innovation when ERP systems are implemented is a good example of this). How organisations can change and be transformed using technology may

mean that potential contradictions should be recognised in order to help in the understanding of points of tension and instability in these same organisations.

In her paper on 'Using Technology and Constituting Structures: A practice lens for studying technology in organisations', Orlikowsky (2000) describes this interaction with technology using three types of enactment

1. inertia: where technology is used as a means of maintaining the status quo
2. application: where technology is used to modify and improve the existing way of doing things
3. change: where technology is used to significantly change the status quo

Orlikowski (2000) shows that different conditions (for example institutional structures – centralised versus decentralised) are about different consequences (for example, processual – how an organisation adapts the technology). These conditions dictate how successful this enactment of technology will be. Orlikowski (1996) had previously suggested that change is an ongoing improvisation by actors – a process that is not bounded up in a specific time or place; “ Change may not always be as planned, inevitable or discontinuous as we imagine” (p.88). Thus the conditions (context) that enactment of technology occurs in cannot always be planned.

Technology according to Orlikowski is seen as a set of enablement's and constraints, which shapes human action and is shaped by them. In Orlikowski and Robey (1991), the rules of structuration theory are applied to help understand the relationship between technology and institutions or organisations. The 'duality' of technology is seen as a product of human action within specific structural and cultural contexts and as an objective set of rules and resources involved in facilitating and constraining human action and hence contributing to the creation, recreation and transformation of those

contexts. Orlikowski and Robey see this as both the constituted nature of technology and the constitutive role of the technology.

Orlikowski and Barley (2001) broaden the scope of research from its traditional focus on phenomena associated with information systems at the individual, group and organisational levels. They do this by addressing the broader institutional and social developments in which technologies are increasingly being examined. This takes a similar position to that of Whittington, which we noted earlier.

Jones and Karsten (2008, p.150) say such research might examine for example how the nature or properties of the national healthcare systems may influence the adoption and use of electronic patient record systems, or how the use of employee e-mail monitoring may be related to broader issues in both society and the workplace.

Jones and Karsten (2008, p.141) show that in a series of papers between 1983 and 1994 (De Sanctis and Poole, 1994; Poole and De Sanctis, 1990,1992; Poole and McPhee, 1983; Poole et al, 1986) Poole and De Sanctis sought to change Giddens structuration theory to address the recurring interaction of technology and social processes. Poole and De Sanctis approach, adaptive structuration theory, is based on a number of propositions, including 'social structures serve as templates for planning and accomplishing tasks...designers incorporate some of these structures into the technology (with the result that the structures may be reproduced or modified) this creating new structures within the technology' (De Sanctis and Poole, 1994, cited in Jones and Karsten, p.141).

Rose and Hackney (2003, p.3) showed that "time space distancing involved the stretching of social systems across time space, on the basis of mechanisms of social and system integration." As the recurrent nature of social interaction extends between people over distance (spatial and geographic) and over time so the level to which those practices become embedded increases. Giddens (1984) was clear that the structural properties

of social systems exist when forms of social conduct are reproduced across time and space.

The routines and practices develop where the actors in the social system engage in social practice, which become reasonably stable over time and space. Routines make up 'the habitual taken for granted character of the vast bulk of the activities of day to day social life' (Giddens, 1984, p.376). When Orlikowski presented her structurational model of technology, some critics noted that she had made some substantive changes to Giddens's conception of structure. Where Giddens posited structures as mechanisms or frameworks within the mind of an actor, Orlikowski envisages structures as concrete elements (e.g. designed features) of a technology artefact. Thus, her critics might contend that she had misread or inappropriately applied the theory of structuration. However, if the theory is applied to a process, which is a set of enacted routines and rituals, the use of structuration theory as applied to process does not conflict with Giddens or Whittington's views. Rather it reinforces the model. However by positioning the Information System (IS) as part of a process the interaction between technology and people becomes clearer. Table 6 (page 91) summarises some key features of structuration theory, their implications and consequent potential issues for research into technology.

Poole and DeSanctis (2004, p.2007) describe structuration theory, as 'one of the most influential theoretical paradigms influencing IS research in the last decade or more.'

According to Orlikowski (in Melin, 2002, p.2) the early work on the roles of technology and organisation assumed technology to be an objective, external force that has a deterministic impact on organisations. Orlikowski's initial work has been followed by research that has focused on other aspects of technology, for example seeing it more as a product of interpretation. Later work has seen technology as an external force having a direct affect on organisations. These affects are controlled and restrained by human actors and take place in organisations.

Orlikowski and Robey (1991) have sought to examine technology through a subjective examination of social structures, human actions and information systems. As such, an information system would be seen to encompass interpretative schemes and provide co-ordination facilities. The system would then be seen to link social action and structure and interaction.

Feature of Structuration Theory	Implication	Potential Issues
<i>Rejection of both positivism and strong interpretativism</i>	Structure does not determine action but nor is action independent of structure	Universal social laws are markedly implausible, but accounts based solely on individual action and meaning are also inadequate
<i>Duality of structure</i>	Structure and agency are mutually constitutive	Structure is inseparable from agency
<i>Structure is a virtual order of transformative relations</i>	Rules and resources exist only in their instantiation and as memory traces orienting conduct	Material resources, such as technology, influence social practices only through their incorporation in processes of structuration
<i>Agents always have the possibility to do otherwise</i>	Structural constraint simply places limits upon the feasible range of options open to an actor in a given circumstance	Agents comply with structural constraints because they choose, rather than are forced, to do so
<i>Agents are knowledgeable about their actions and continuously reflect on their conduct</i>	Agents are not passive objects, subject to exogenous forces, or ignorant of the influences on their actions	People, including researchers, should be considered as active, reflexive participants in the practices in which they engage
<i>Unacknowledged conditions and unintended consequences</i>	Production and reproduction of society is not wholly intended or comprehended by social actors	Social generalisations are necessarily contextual
<i>Essential recursiveness of social life</i>	Society is a complex of recurrent practices that constitute social institutions	Individual action needs to be understood in its ongoing relationship with large scale social organisation
<i>Time space distanciation</i>	Societies stretch over spans of time and space	Technology may be able to facilitate some level of social integration at a distance

Table 6 : Features of Structuration Theory and Implications for Research (from Jones and Karsten, 2008, p.137)

Orlikowski (1992, p.403) employed structuration theory to reconstruct the concept of technology and thus to propose a model for investigating the relationship between technology and organisations. In defining the concept of

technology, she restricted its scope. Orlikowski restricted scope to a simple definition, this being various constructions of software and hardware. Orlikowski concluded that a definition such as this was “consistent with the view that overloading the technology concept is unnecessarily limiting, but it should be understood as an exclusive focus on technology as a physical object” (1992, p.403).

To contrast this, by separating out the technology from the action of the actors, this allowed the software and the hardware, the artefacts so to speak to be seen as having a structure to themselves, and as such to be a result of the human action, thus they gained a status of being social. This framing of artefacts as being social also give us the ability to conceptualise the technology as being a result of interaction between the human agents and the technology itself, thus giving both structure and social construction.

3.5 Structuration and Social Processes

Giddens, (1976, 1984) social theory and Bernsteins, (1978) and Bhaskars (1978) philosophy of science work (in Orlikowski, 1992, p.403) “has challenged the longstanding opposition in the social sciences between subjective and objective dimensions of social reality and proposes an alternative meta-theory which incorporates both dimensions.”

The theory of structuration is an alternative meta-theory, and a number of researchers in the organisational sciences have adopted and used the theory in their analyses of processes ((Ranson et al., 1980; Manning, 1982; Riley, 1983 ;Smith,1983; Spybey, 1984; Pettigrew, 1985; Roberts and Scapens, 1985; Barley, 1986; Willmott, 1987) in Orlikowski, 1992, p.403). For these researchers and Orlikowski herself, structuration offered a possible solution to choosing between subjective and objective models of organisations. It allowed the researchers to embrace both concepts.

Orlkowski in this seminal paper (1992, p.404) reiterated “structuration is posited as a social process that involves the reciprocal interaction of human

actors and structural features of organisations.” As such the theory of structuration as have seen makes out that human actions are both enabled and constrained by structures, yet that these structures are the result of previous actions. Giddens (1984) as we have seen was clear that the structural properties of social systems exist when forms of social conduct are reproduced across time and space. Rules and resources govern this social conduct. These rules and resources are in use by the actors in everyday interaction. These rules and resources as such control human action, while at the same time they are reinforced through use.

Orlikowski (1992, p.404) notes that in “this theory the role of human actors in reaffirming structural properties is highlighted so as to avoid reification. The recognition that actors are knowledgeable and reflexive is a central premise.” Giddens (1984) notes that all social actors are highly learned in respect of the knowledge that they possess and apply in the production and reproduction of day-to-day social encounters. Orlikowski (1992, p.404) defines reflexivity as “the capacity of humans to routinely observe and understand what they are doing while they are doing it. It includes the continuous monitoring of physical and social contexts and activities, (their own and others).”

It is through the patterns of interactions that are occurring and reoccurring that standardised practices emerge. These may include ways of manufacturing products, serving customers, managing suppliers, procuring goods or services. Over time, the repetition of these practices eventually becomes institutionalised thus allowing the formation of the structural properties of organisations. “These structural or organisational properties (structure) are drawn on by humans in their ongoing interaction (agency), in turn reinforcing the institutionalised properties” (Orlikowski, 1992, p.404). This is know as the as duality of structure. To date these issues of knowledgeability and reflexivity have been little explored in IS research and offer potential for research, such as carried out in this work.

Giddens (1984) developed his ideas further by observing that when humans act in organisations, three fundamental elements of social interaction are

created: he named these meaning, power and norms. While these are highly independent and in practice cannot be separated, for research purposes they can be treated as distinct element, thus allowing the examination of each from both the perspective of human agency and institutionalised properties. Rose and Hackney (2003) in their examination of the application of structurational theory of information systems break out two aspects, which are worthy of consideration. These are two independent sets of phenomena based on structure and agency. Giddens dimensions are described and shown in figure 12.

Rose and Hackney (2003, pp. 2-3) showed that social structure and human interaction could be broken down into three dimensions. They did this for the purposes of analysis. Figure 12 shows the recursive character of these dimensions by linking the modalities. As there is interaction between the actors, this gives rise to interpretative schemes for the actors, so they can make sense of what they are doing, and at the same time these schemes are interpreted and reinterpreted and modified which are then embedded in structure giving rise to meaning or signification. Similarly figure 12 illustrates how facility is used to allocate resources through the wielding of power, again producing and reproducing social structures for domination. Moral codes (norms) help determine what can be condoned or sanctioned in human interaction, which again through producing and reproducing structures lead to legitimisation.

Rose and Hackney go further in citing (2003, p.3) “how Giddens distinguishes between emergent regularities of social practice which constitute society via the process of structuration and periods of marked societal change” as shown in Figure 13.

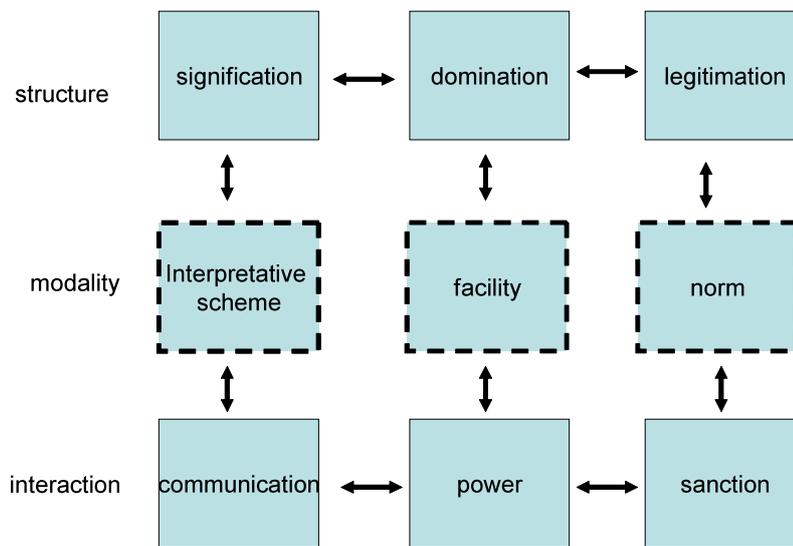


Figure 12 : Giddens dimensions of Social Structure and Human Interaction (from Rose and Hackney, 2003, p.3)

Rose and Hackney suggest that following the model in Figure 13 can provide a basis for collecting data, analysis of that data and finally the development of theory. Figure 13 gives an illustration of how to examine social systems development. In particular in examining episodes of change, Rose and Hackney suggest (2003, p.3) that the researcher “should look at their origins: the expansion of the time space distancing of social systems, the intertwining of different modes of regionalisation involved in the processes of uneven development and the prevalence of historicity as a mobilising force of social organisation and transmutation”. The ‘Type’ refers to large and strong / weak the change is, perhaps how a series of changes disrupts or reshapes an existing arrangement of institutions or organisations. The ‘Momentum’ refers to the speed at which the change occurs, while ‘Trajectory’ defines the overall direction of the change. Examples of each include for origin, how perhaps the development of an IT system may be driven by one functions needs i.e. the finance department demanding a financial system to manage costs,

momentum might refer to the speed at which this system can be implemented, type might indicate the spread of the system i.e. who will use it, how it will be deployed, while trajectory would indicate perhaps a move to a more controlled environment with the implementation of such a system.

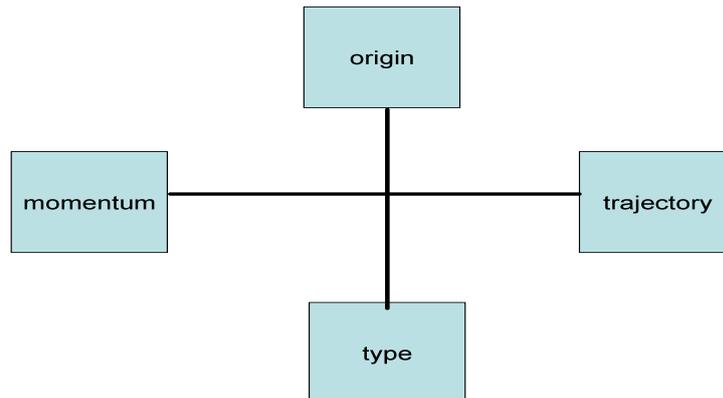


Figure 13 : Effects on Social Practice (from Rose and Hackney, 2003, p.3)

“Because organisation studies and information technology are disciplines dedicated respectively to studying the social and technical aspects of organisation, cross- fertilisation and collaboration between the two would seem to be beneficial for documenting and assessing changes taking place in the world around us “(Orlikowski and Barley, 2001, p.146)

3.6 Structuration – Recent Criticisms

Theory regarding implementation of new technology looks at change dependant both on structures embedded in the technology, but also on user’s perceptions, adoption and usage of new technology on a micro level in the organisation (Orlikowski, 1992; Orlikowski and Barley, 2001; Tsoukas and Chia, 2002).

Jones and Karsten (2008) reviewed 300 papers from the last 20 years. Schwarz (2002, p.155) showed that initial "work had witnessed the development of the structurational perspective on technology as an alternative outlook on change (Barley, 1986, DeSanctis and Poole 1994; Orlikowski, 1992; Orlikowski et al, 1995)". This perspective of technology draws on Giddens (1979, 1984) process of agency and social structuring. This perspective of technology supports the duality of structure. This perspective according to Schwarz (2002, p.155) "acknowledges that agency and structure are mediated by and guide human agents. The use of IT has been recognised as being strongly influenced by the user's understandings of the properties and functionality of a technology."

Jones and Karsten (2008) found that the research was clustered on particular systems, e.g. decision support systems, computer mediated communication, groupware systems and knowledge management. The main focus was on types of research where the importance of social factors was widely recognised. They found that given "Giddens developed structuration as a general theory of society and that his main focus, both in his discussion of structuration and more explicitly, in much of his later work, has been on the constitution of contemporary society, is that structurational IS research has paid little attention to the broader social context of the phenomena that it addresses" (2008, p.139)

The studies identified have not always critically engaged with structuration. Jones and Karsten conclude that there seems to be an opportunity instead to "illustrate how technology research can use social theory as a starting point, not for independent theorising, but for analyses that seek to extend the original ideas to enable them to address significant issues that were previously overlooked" (2008, p144). More significantly areas for research may be

- Studies that address processes in broader contexts that just the specific organisational settings, perhaps at a sectoral level as in the case of this research

- Studies in environments where structuration is seen to be restricted.

3.7 Research Themes, Research Questions and Objectives

Chapter 2 and the Chapter 3 to this point have highlighted a number of research themes and gaps in the understanding of the procurement process. The research agenda is set out in figure 14. This puts a structure to the research, identifying the themes, the main research questions and the key objectives of the research. Six themes were identified from the literature, these being

- Theme 1 the changing relationship between IT systems and organisational structure
- Theme 2 looking at technology in the context of procurement.
- Theme 3 focus on public sector
- Theme 4 interaction of technology and people in the context of a process
- Theme 5 research of the public procurement process in a single constituency
- Theme 6 context the procurement process is carried out in.

The research questions are

- What roles does technology play in the procurement process?
- How does technology impact the procurement process?
- Why does technology impact the procurement process in the way that it does?

The research objectives are

- To show the drivers for the public procurement process in the Republic of Ireland since 1990 – this addresses themes and research questions
- To illustrate the internal and external drivers for the introduction of technology into the public procurement process – this addresses themes and research questions
- To map the public procurement process within the Irish Health Sector – this addresses themes and research questions
- To demonstrate that the procurement process can be examined as single structural entity –this addresses themes and research questions
- To demonstrate that technology impact on process can only be examined through an understanding of context – this addresses themes and research questions
- To develop a conceptual framework for the assessment of the role of technology on the public procurement process and to show its practical use – this addresses themes and research questions

There has been little research on the impact of technology on the public procurement process. Furthermore although there is some overlap in definition of the procurement process, there has been no clear conceptual model of public procurement process found in the literature. To-date, the impact of technology research has been organisationally directed and as such the focus of the research is to direct this towards process. The procurement process can be seen as embodying interpretative schemes, providing co-ordination facilities and is deeply implicated in linking social action, structure and interaction. The research thus explores this interaction within a bounded setting, namely the public sector.

The six themes of the research are outlined in Figure 14 and their relationships with the objectives are clearly shown. Three key areas can be identified in these themes, these are the procurement process, context that the procurement process operates within and the technology used. The literature quite clearly showed there were gaps in researching public sector procurement. It was thus decided that the process being examined was the public sector process. The literature also demonstrated that the context for both the process and technology was critical. There has been extensive research on technology and its uses both at an organisational and process level. There has also been research carried out on individual pieces of technology. However the literature review highlighted that the role of technology had been examined in the context of the procurement process as a single entity. It was thus concluded that these three areas needed to be researched.

In developing the research, it was found that it was key to establish if there was an interaction between all three areas. The literature demonstrated that context and technology were interlinked, that context and structure (bounded process) were linked and that technology and process were linked. The first theme of the research is the changing relationship between IT systems and organisational structure. With the development in technology over the past few years and in particular with the rise of enterprise resource planning (Holland et al., 1999), focus has shifted in research from looking at what efficiency and effectiveness gains have been made through the implementation of technology to the impact of technology itself on the organisation.

Where Giddens posited structures as mechanisms or frameworks within the mind of an actor, Orlikowski envisions structures as concrete elements (e.g. designed features) of a technology artefact. Orlikowski and Robey (1991) argue, as has been seen, for a combination of a subjective assessment and an examination of social structures, human actions and information systems (technology). An IS as discussed in previous sections embodies interpretative schemes, provides co-ordination facilities and is deeply implicated in linking

social action, structure and interaction. There is a gap in the literature in that the process has not been seen as a bounded entity for the examination of technology impact.

Quite clearly the literature has focused on impact of technology at an organisational level or at a sub-process level. This first theme examines the role of structure and posits that a process is a bounded structure and as such can be researched similarly to organisations, thus filling the void in the current literature. In examining organisations and processes, the models proposed by Giddens (1984) and used by Rose and Hackney (2003) (Figure 12, page 95 and Figure 13, page 96) will be adopted and used to explore this theme of structure.

The second theme for the research is to find a way of looking at technology in the context of procurement. Kallinikos (2004) describes how organisational-wide information systems move a step further in shaping human agency in organisations than traditional MIS or expert systems. Killen and Kamauff (1995) point out that in many organisations paperwork often serves merely to document a chain of events or to provide a logistical paper trail.

Brenner and Hamm identified a clear need for information technology for purchasing. However as the purchasing moves to operate in a process environment, where there is a preponderance of unstructured activities, or more so in a value chain context, where there is a high dependency on other external links outside of the organisation, new ways of looking at technology become critical. The literature to date in the field of procurement has focused on individual technologies (e-procurement for example) and the assessment of impact at one stage of the procurement process (Brandon-Jones and Croom (2005) for example). The research here explores the impact of technology (as defined in a broader sense) on the procurement process as a whole.

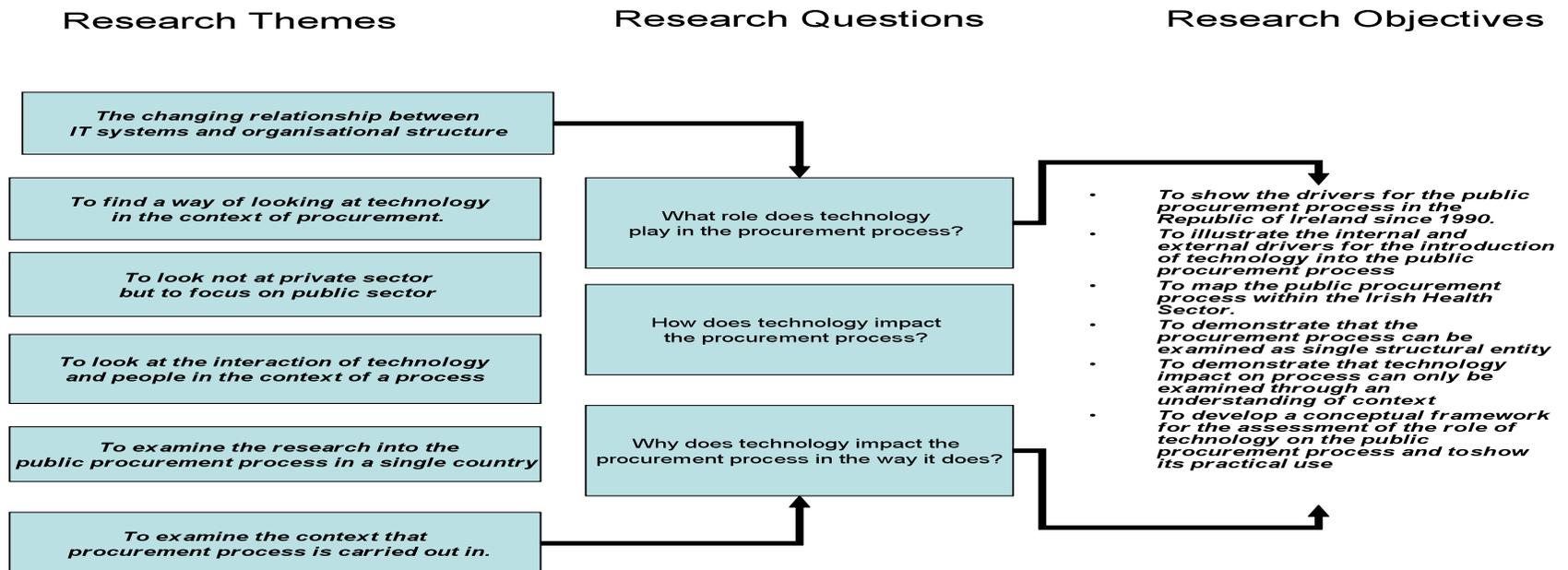


Figure 14 : Overview of Research Agenda

The third theme is then to look not at private sector but to focus on the public sector in the research. There is a lack of academic research (Thai (2001)) into public sector procurement. It has been noted (Zenz (1994)) that procurement in the public sector differs from the private sector in a number of ways, the most notable being that it is more highly regulated and politically constrained than the private sector, and thus it is more bounded. When the process is examined (Table 3, Page 65) and the steps of the various sectors combined, it has been shown that there are common steps across all of the models. The procurement processes as outlined by Gershon (1999) and Caldwell (2007) are based purely on public sector practice; the other models include elements of private sector practice. The research is focused on adding to the public sector research by examining in more detail the procurement process in the public sector.

The fourth theme of the research is to look at the interaction of technology and people in the context of a process, the process being defined in the same way as the traditional view of an organisation. As a key part of understanding structuration theory, Giddens (1984) encourages the researcher to seek connections between consciously and unconsciously motivated, purposive, reasoning behaviour and social constraint and enablement.

Giddens (1984, pp. 178-179) stated that

“...The actors have good reasons for what they do, reasons which the structural sociologist is likely to assume implicitly rather than explicitly attributing to those actors...all explanations will involve implicit reference both to the purposive, reasoning behaviour of agents and to its intersection within constraining and enabling features of the social and material contexts of that behaviour. “

He goes further

“...theorizing the self means formulating a conception of motivation and relating motivation to the connections between unconscious and conscious qualities of the agent. The self cannot be understood outside history - history meaning in this case the temporality of human practices” (1984, p.36)

Giddens (in Orlikowski, 1992, p.404) recognised that actors are knowledgeable and reflexive is a central premise. He noted that all actors for example social, all human beings are highly learned in respect of knowledge, which they possess. He further noted that they are able to apply this knowledge and thus learn through the production and reproduction of day-to-day social encounters. Reflexivity was seen in Section 3.5 as referring to the capacity of humans to routinely observe and understand what they are doing while they are doing it (Orlikowski, 1992, p.404). Reflexivity includes the continuous monitoring of physical and social contexts and activities. The participant’s knowledge and reflexivity is always bounded to some extent by the contextual nature of the action, by the difficulty in articulating tacit knowledge, by the unconscious sources of motivation and finally by unintended consequences of action. Thus the process again as a bounded entity is to be studied here. The literature although focusing on business processes (Lind and Goldkuhl, 2005a) does not address the procurement process in this way at all. Contextual setting of the process is critical as is the setting of the actors in a specific environment. The research addresses the gaps in the literature by examining the procurement process through the structuration lens.

The fifth theme is then to examine in the research the public procurement process in a single country, but to examine the whole process. Reck and Long (1988) emphasised that purchasing and materials management represents a basic strategic business process, rather than a narrow specialised supporting function to overall business strategy. It has been seen that traditional purchasing compared to modern procurement has tended to concentrate on the 3rd and 4th stages of the process only. The literature tends to focus in on single elements of the process, however procurement spans the supply chain as defined and the management of procurement in a modern organisation

encompasses logistics management as well. Thus the research addresses this issue.

The process used for procuring leverage and non-critical items was termed product-oriented procurement process, while the second used for bottleneck and strategic items was called supplier-oriented process. It must be noted that these processes operated within the private sector and as such the model for public sector procurement varies from country to country. The research does focus on a single country but within the context of the wider public sector in Europe. It takes into account that public procurement in Europe is governed by Directives and as such places boundaries on the process.

The sixth theme builds on the fifth theme by examining the context the procurement process is carried out in. Given that the public sector is a broad area and the isolation of technological factors is critical in establishing a link between the technology and the actions taken. To aid in doing this, Harland's public supply model is used. This is used in analysing the context for process within a single constituency e.g. country.

These research themes are built in order that the research question proposed can be explored.

How can the role of technology, in the context of the public procurement process, be assessed by addressing the process as a single bounded structural entity?

In order to explore this question it is proposed to approach the research through the development of research questions as described. The research is then focused on assessing the role and impact of technology in the context of a process, which is bounded.

In order to explore the research themes, questions and objectives, it is critical that a theoretical research model is proposed. This is described in Chapter 4, section. The initial conceptual framework is developed from the key streams of

Chapters 2 and 3, these being the procurement process, the context and the technology.

3.8 The Procurement Process - Revisited

Table 3 (page 65) outlined a number of different procurement models. The public sector model as described by Gershon (1999) was a generic model. When Caldwell et als. (2007) model was examined, although based on international research, there were initial gaps identified in the model, which had been evaluated in the literature review, in particular the lack of specific impact of the European Legislative regime.

<u>Private Sector</u>	<u>Public Sector</u>
Identify or re-evaluate needs	Specification Phase
Define and evaluate user requirements	
Decide to make or buy – Identify type of purchase	
Conduct market analysis	
Identify all possible suppliers, Supplier contact (Request for quotes are advertised or direct contact made with suppliers)	
Prescreen all suppliers	
Evaluate remaining supplier base	Selection Phase – done under public tendering rule – EU Directives
Choose supplier	Contracting Phase
Deliver product / perform service	Ordering
Post-purchase / make performance evaluation	Expediting and Supplier Evaluation
Renewal	Follow up and procurement evaluation
Ending the relationship	

Table 7 : A comparison of Public and Private Sector Procurement Processes

The author in Table 7 presents a comparison of the processes between public and private procurement. What was clear from the literature was the lack of clarity around the steps involved in the public procurement process. It was

decided to adopt Gershons (1999) model as the generic process and within the research to develop details about each of the steps involved in the process.

3.9 The Context for the Procurement Process

It had been seen in the literature that an understanding of the context for both technology impact and process analysis was needed. Harland et al.'s (2000) model (Figure 10, page 79) has been used to examine the context for supply strategy in the public sector. In examining the model it became clear that a number of levels existed and were explicitly stated, these being the level of government action, the sector within the public sector, the level of organisational action. In reviewing the literature it had been concluded that the process being examined was a public procurement process within the European Union, thus this dictated that this level of influence would need to be examined. The following levels were identified to examine the context for procurement:

- European Union
- National
- Sectoral
- Organisational

A further breakdown between Agency and Organisational became evident as the initial reviews of the Irish Health Sector were carried out. These initial reviews are presented in Chapter 5 in the Section 5.2 and 5.3 where a sectoral analysis was carried out. This further breakdown also became evident when the framework was used at an individual organisational level (Cases 1 and 2) and at an agency level (Case 3). The framework was further refined, and the coding shown in Figure 18, page 127 was adopted for the longitudinal study.

3.10 The Technology Framework

The literature review showed up a variety of definitions for technology. When the technology for procurement was examined it was found that Brenner and Hamms (1996) framework for the classification of technologies allowed

technologies to be grouped. Brady (2003) had proposed that technologies should be examined as groups rather than specific individual technologies.

Type	Annotation
Inter Organisational Low Structure	IOL
Inter Organisational High Structure	IOH
Intra Organisational Low Structure	IOFL
Intra Organisational High Structure	IOFH
Interfunctional Low Structure	IFL
Interfunctional High Structure	IFH

Table 8 : Categorisation of Technologies (adapted from Brenner and Hamm, 1996)

It was thus decided that the framework being proposed would examine groups of technologies. The framework adopted the Brenner and Hamm (1996) classification, as set out in Table 8 will be used as the first axis of the conceptual framework being proposed to examine technology.

These categories enabled the model to identify clearly the typology of technology and in matching this to the step in the procurement process, the framework enabled conclusions to be drawn as to where technology was impacting on the procurement process.

The proposed framework is shown in Figure 15, it allows for a visual representation of the analysis, showing the interlinkage of all three axes.

3.11 Implementation of the Framework

In using the framework, the objective is to establish what step of the procurement process is being examined the typology of the technology being used and the context for the use of that technology. The initial usage of the framework is to allow an assessment of current technologies being used. In order to do this the following step by step process is carried out

1. Observe the process
2. Identify the process steps where technology is being used
3. Identify the technologies being used
4. Classify the technologies according to the typology outlined
5. Assess the context that the technology is being used in
6. Make recommendations for the technology based on
 - a. Context – is it legislated or policy driven
 - b. Appropriateness – is it appropriate for the step or steps
 - c. Review - current technology be reviewed for inappropriate usage

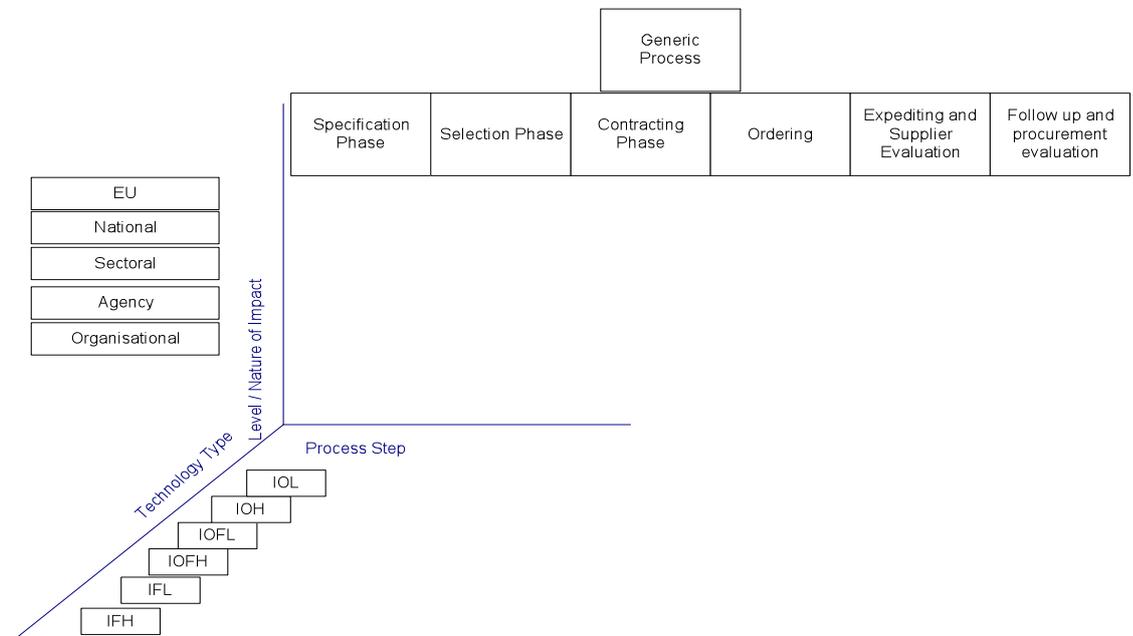


Figure 15 : Proposed Conceptual Model for Technology Impact Assessment

It was proposed that the framework would be sufficiently developed such that assessment of any new technology could be carried out.

3.12 Chapter Summary

This Chapter set out the development of structuration and how the conceptual framework was developed from the gaps in the literature and how the key question ‘what role does technology play in the procurement process?’ would be addressed.

The themes of the research were shown to contribute to the development of the framework. Finally a description of how the framework if given with an examination of how it was used in practice was outlined.

This chapter forms the linkage between the literature review and the methodological approach to the research and application of the framework in practice.

Chapter 4 Methodology and Research Design

4.1 Introduction

The methodology and research design is described in the following way. Section 4.2 considers some of the basic assumptions about research philosophy and my ontological position. Section 4.3 specifically addresses the debate on research philosophy and my epistemological position. It reflects further on how personal experience influences the direction and development of the research approach and methodology. The methodological approach taken to the design of the research and a justification of the methodology chosen is then covered in sections 4.4 and 4.5. Section 4.6 describes the overall approach to the research e.g. the research strategy. Section 4.7 describes the procedures and protocols implemented during my research. Section 4.8 outlines the approach taken to the analysis of the data. In Sections 4.9 and 4.10 there is a brief discussion of how this research can be validated, followed by an outline of the limitations of the research methodology. Finally the ethical considerations, which were taken into account when conducting the study, are explored in Section 4.11.

The overall purpose of this chapter is to describe in detail the approach taken to my research. Designing the methodology and the research process should always be done with the research question in mind; because of this, I adopted and demonstrated a structured approach to the research. There is a general belief that research should start with a clear and accurate research hypothesis that guides the researcher throughout the research and this approach is evidenced in this chapter. However, although this general belief draws from the quantitative research field, there is a strong tendency in qualitative research to start with a less focused approach that develops over the course of the research. So although a clear research question was posed at the inception of the research, over time this research question was refined into a series of research questions which were further refined and thus the area of research became focused. Hence the research process for this thesis, probably in

keeping with most others, was not fully planned before the start although a work plan was initially laid out. As was pointed out by Remenyi, Williams, Money and Swartz, (1998), the non-planning showed up also as a feature of the methodology chosen – the case study. It is thus critical that in order to defend the research, the methodology is shown to be appropriate. This chapter therefore lays out the approach, the protocols and procedures followed throughout the research.

4.2 Research Philosophy and Ontological Position

Myers (1997) states that all research (whether quantitative or qualitative) is based on some underlying assumptions about what ‘constitutes’ valid research and which research methods are appropriate. A generic approach to research is suggested by Saunders, Lewis and Thornhill (2000,pp. 84-85). They used a model to depict issues underlying the choice of data collection methods. They called this the research onion. The layers of the research ‘onion’ are made up of

- Research philosophy
- Research approach
- Research strategy / methodology
- Time horizon
- Data collection methods

Research generally begins with a question or problem. Therefore research is found to require a decision making process (Brannick and Roche, 1997), with the initial decisions arising from a set of beliefs that a researcher holds. As approaches in the different layers also have dependencies, it is suggested that a research design should be developed from the outside in, i.e. starting from the outside layer thereafter peeling away each layer until the fifth layer is reached.

Ontology is the reality that is investigated in research (Perry, Riege and Brown, 1999). It was recognised by me that different ontological views of the world could exist. In the course of my research it became clear that the personal view

of the researcher, my view, was a view that had to be established and understood, rather than being an obvious truth. Giddens (1984) offers a view of role and social position. All roles that one plays or acts out are an important element in examining research. In particular the role played by one whose background is practitioner based and not academic based. Giddens (1984,p. 84) adopts a formulation of role and social position,

“A social position can be regarded as a social identity that carries with a certain range (however diffusely specified) of identity (or is an incumbent of that position) may activate or carry out: these prerogatives and obligations constitute the role prescriptions associated with that position.”

In Chapter 3, the theory of structuration was introduced. It demonstrated how the development of IS research and in particular the development of the use of structuration theory in IS research has grown in recent years. In particular the development of structuration was linked to the conceptual model used for my research. As a key part of understanding structuration, Giddens (1984, pp.178-179) encourages the researcher to seek connections between consciously and unconsciously motivated, purposive, reasoning behaviour and social constraint/enablement... he states

“The actors have good reasons for what they do, reasons which the structural sociologist is likely to assume implicitly rather than explicitly attributing to those actors...all explanations will involve implicit reference both to the purposive, reasoning behaviour of agents and to its intersection within constraining and enabling features of the social and material contexts of that behaviour “

He goes further

“Theorising the self means formulating a conception of motivation (or so I shall argue) and relating motivation to the connections between unconscious and conscious qualities of the agent. The self cannot be

understood outside history- history meaning in this case the temporality of human practices” (Giddens, 1984,p. 36).

It is this defining of one self in terms of the work and the research that is critical. The journey through the research of the doctorate has not been done in isolation but has involved daily work outside, which in turn has influenced the direction of the research, but also the direction of the my career.

At the beginning of my research I found myself asking ‘what is theory?’ I needed to acknowledge my scientific and engineering background. To me theories are statements about the relationships between abstract concepts or variables. I found myself comfortable with the idea of deductive theory: whereby the researcher (me) presumes a relationship between particular variables ahead of time and then deduces a testable hypothesis, this being the traditional approach of science. Hence theory precedes the research.

However because of my business background and my development as an academic I found my position shift over the past five years. I have moved from the deductive approach to the inductive approach, whereby during the research every identifiable variable that might relate to a communication phenomena has been examined and the researcher has proceeded to start to build a theory. The research has preceded the theory. This has involved the discourse of doing, whereby practice and enquiry have been blended together by the researcher.

To understand ones role is to understand that one comes with a history and also creates a history through ones actions. This research has not been action research, yet the role of me as both researcher and academic has perhaps been a developing one, which is not yet finished.

“Perhaps communication ... can be understood as a “practical discipline” in which, critical, interpretive, and empirical research, as well as applied work, have deeply related functions to perform” (Craig, 1993,pp. 26-37).

In this section, the background to me as a researcher and as such the ontological position has been outlined. In particular it has been shown that one's role and social position comes from one's history, but that this history is not something that is written but is continually being written. I have tried to show how Giddens (1984) view of structuration is not based around a singular temporal position but can be complemented also by biographical reflexivity.

All research though must have a structure, whether it is for a quantitative approach or a qualitative approach. Consequently the approach for this research came initially from the research question and not particularly from the beliefs held, although one can influence the other. Ticheurst and Veal (2000,p. 18) argue that "there is considerable debate among scholars...about the relative merits and value of qualitative versus quantitative business research... and that the debate is often aligned with differing philosophical positions". This is further emphasised by Saunders' "research onion" approach. An inductive approach to this research has been taken. This is due to the nature of the research problem and the use of structuration as key part of the methodological approach. The nature of the research problem is that a business process can be socially constructed.

4.3 Research Philosophy and Epistemological Position

The theoretical perspective of the research is one of the most important factors in determining the choice of approaches. There are two major approaches to theory development, deductive theory testing and inductive theory building (Perry, 1998). Perry goes further by stating that the "difference between the two approaches can be viewed in terms of two scientific paradigms, with the deductive approach representing the positivist paradigm and the inductive approach representing the phenomenological paradigm" (1998,p.78)

Guba and Lincoln (1994) develop this concept by dividing the phenomenological paradigm into three, critical theory, constructivism and realism. However in looking at these paradigms it must be stressed that the

extremes, although showing how different knowledge is perceived, do not take into account the complexity of the research being examined.

Knox (2004,p.120) states that by linking methodology with the understanding and interpretation of philosophy (positivism and interpretivism), as described above, the research process 'becomes a quagmire often too difficult for researchers or students to fathom successfully, given the number of other constraints, they face ranging from lack of time, intensity of programme, through to willingness to engage with the literature.'

Saunders, Lewis and Thornhill (in Knox, 2004,p.120), states that the research process is rarely rational and straightforward but rather the reality is considerably messier. Saunders refers to the research as an onion, and that within this onion the researchers approach flows from the research philosophy. However he goes further by stating that labelling research in this fashion is potentially misleading.

Easterby-Smith et al (in Knox, 2004,p. 121) show that the relationship between research philosophy and research method is an important one as it allows a researcher to

- take a more informed approach about the research methods
- decide which method(s) are appropriate for the piece of research
- think about the constraints that may impinge on the research.

Knox (2004,p.123) in his debate goes further by stating that doctoral students should be looking at how the philosophy impacts on each element within the research process and the whole research relationship.

The issue arises though, when the research question to be addressed is one that can be answered through an inductive approach, yet clearly the philosophy belief debate would suggest that a deductive approach should be taken. Knox (2004,p.124) shows that the idea of 'elective affinity' allows the identification of individual ontological views, which select, or lend themselves to certain

approaches but by being aware of these allows the selection of tools available for a particular piece of research. This concept of elective affinity, as Knox puts it, leads to the statement that there is a relationship between theory and methods, but that although this relationship is identified, it is not regarded as totally exclusive.

An initial consideration of the research suggested that a positivistic approach would be preferable, if not even required. Adaptive Structuration Theory (AST) outlined by DeSanctis and Poole (1994, p.131) very clearly indicates a positivistic approach. Through the use of AST, it is suggested that it is possible to develop a proposition of the form... 'Given advanced information technology and other sources of social structure n_1 to n_2 and ideal appropriation processes and decision processes that fit the test at hand, then desired outcomes of advanced technology will out'. However the area under investigation was relatively unexplored and the concepts and phenomena although clearly defined within the Information Systems Literature, were not clearly defined within the area of Business Process. Further, although the value in importance of being able to explain how and why phenomena occur was evident and the usefulness of trying to establish causal links of value to others than the subjects of the research was acknowledged, I decided that an inductive approach added value and was of use to others if the research is well structured.

The selection of an innovative research question is not a single act or decision but rather a process, an attitude, a way of thinking.

But a basic research question that one must ask is 'how do we know what we know? There are four basic premises at play here, these being Tenacity, Authority, Intuition, and Science (Cutcliffe and McKenna, 2002, p. 611).

Tenacity is built of traditional knowledge; it is true because we have always believed it to be true. Authority is built of 'referent knowledge', which is knowledge from a trusted source. The third is intuition: 'a priori method', here open and reasoned discussion allows the truth to become self-evident. The final premise is science, where empirical study provides a justifiable and

standardised framework for building theory, it having the advantage of self-correctiveness. The research question posed for this research is

How can the role and impact of technology, in the context of the public procurement process, be assessed by addressing the process as a single bounded structural entity?

Previous research on the impact of technology has taken a variety of research perspectives (Orlikowski, 2000) and these perspectives have developed in parallel with research perspectives on organisations. The developments in organisational research and in particular the use of case research in building theory has been critical in influencing the direction of this work. The use of structuration as a fundamental concept in itself, dictates an inductive rather than a deductive approach, although I acknowledge that Giddens does not feel it is black and white as to which approach should be used.

4.4 Research Design and Approach

Perry (1998) has described a number of research approaches. Two theory approaches, which are similar in nature to that of Perry, are theory development and theory application. The theory development application has three steps, exploration, explanation and testing, while that of theory application also has three steps, diagnosis, construction and implementation. There are two main research cycles for management studies, the empirical cycle and the design cycle and the development of theory emphasises the design cycle (Eekels and Roozenburg, 1991). An aim of this study is to develop theory regarding the role and impact of technology on the public procurement process.

This research primarily follows the development of theory and it has followed a framework, which was developed by me and is outlined in Figure 16. The dotted arrows indicate the iterative nature of the research. The initial conceptual framework (Figure 15, page 109) was developed from the literature. It set out the three axes to be examined, context, process, and technology. The research

questions were linked to these three axes and built on the research themes as set out in Figure 14, page 102. These were further developed as the research questions were answered through the case studies. I carried out reviews of the literature throughout the research. These were developed through the presentation of conference papers (nine peer reviewed papers) over the course of the thesis. The feedback from the conferences and further readings informed the development, of the conceptual framework. Again the approach taken to developing theory follows the overall approach to the thesis, which builds on Giddens, in that the reality is constructed. Here the nature of the conceptual framework changed over time due to the interaction of me as the researcher and the research. I drew on the structures that were initially constructed and then reconstructed them. The final conceptual framework is only proposed after the analysis and data organisation, although it is recognised that this is only final from this piece of research but that this may change as it is adopted by other researchers or used in other contexts.

Research Framework

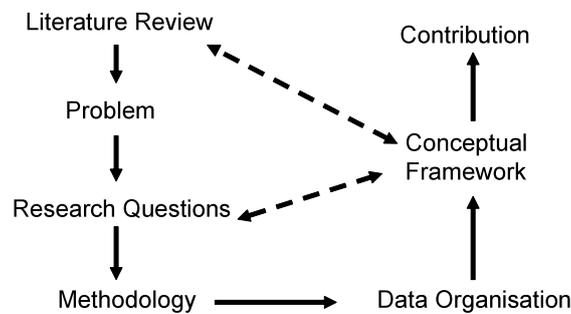


Figure 16 : Research Framework

Previous studies in the area of the impact of technology have taken a number of different approaches. However the most common form of qualitative method used in information systems research is the case study (Orlikowski and Baroudi,

1991; Alavi and Carlson, 1992). The literature review and in particular Chapter 3, the discussion of alternative approaches using structuration theory indicated that the research approach should be qualitative, inductive and that case study was the most appropriate approach. As Benbasat, Goldstein and Mead (1987,p. 376) highlighted the three strengths of this approach are

- The phenomenon can be studied in its natural setting and meaningful relevant theory can be generated from the understanding gained through observing actual practice
- It allows the questions of why, what and how to be answered with a relatively full understanding of the nature and complexity of the phenomenon
- It lends itself to early, exploratory investigations where the variables are still unknown and the phenomenon not clearly understood.

As the issue of 'how does technology impact the procurement process' was further reviewed, I found that the use of the case study approach could be seen as the most appropriate methodology, from two perspectives. Firstly, as identified by Eisenhardt (1989), theory development with case study can and does make a valuable contribution to research and can lead to novel theory generation. Secondly, as identified by Orlikowski (1992), that in examining structures which are not located in organisations or in technology, but are enacted by users, the case study approach offered appropriate methodology for examining these complex interactions.

The nature of the iterative development of the framework, allowed for multiple interactions with the literature.

The research addresses the issue of a process being a structure and as such the use of Giddens (1984) structuration theory (Section 3.7) which offers an account of structure and agency; social practices developing and changing over time and space, is critical. This is revisited many times through a reflective process in developing and carrying out my research.

As stated previously this study followed the inductive approach where the data was collected and a theory developed as a result of the data analysis. Through interviews, observation and focus groups access was gained to the meaning that humans attach to events. The concern for generalisability was low as there was an understanding that the context within which the research was done greatly influenced the outcome of the research results. The objective of using the inductive approach was to ensure understanding the deeper structure of the research problem was comprehensively covered.

4.5 Justification of Methodology

In order to investigate the research questions and to achieve the objectives and aims it was proposed to conduct the research using a mixed method approach. This involved secondary data being collated about the sector and an in-depth case study.

The purpose of the literature review was to maintain an ongoing knowledge of current theory and practice within procurement. A secondary consideration was to adopt the knowledge such that it could be re-interpreted and put forward as areas for publication or public presentation. It was important as part of the literature review, as for the other methodologies, to distinguish between form and content. A rough translation of the terms is that content designates the more readily apparent aspects of some activity or behaviour usually described by terms familiar to lay persons. While form refers to the analytical properties of those same activities or behaviours, usually only through the application of constructs contained within a theoretical framework. This outlining of form was one of my primary aims of the study.

It was also proposed that an objective of the literature review was to provide background, perspective and technical knowledge useful in conducting the rest of the research. It encompassed textbooks, current and past research, journals and EU/Government Publications. Meeting these objectives is exhibited throughout the text.

The Case studies were to be focused and in-depth in a single area; the Irish Health Sector. The rationale for using the case study approach was that there are a number of processes and interactions, such as social functioning and personality in the procurement process, which cannot be studied effectively except as they interact and function within the bodies and entities themselves.

In the main, the Case studies reflected the acknowledgement of a number of considerations. It was noted that a ‘clean theoretical slate’ approach to case study building couldn’t be taken. This supports the view that Eisenhardt (1989) stated, that the research purpose, site selection and information gathering requires some rationale, indicating at least some theoretical basis. The framework by Rao and Perry (2003) and the approaches taken by people working in IS research suggested that an interpretive inductive approach was the most suited as shown in Table 9.

	<i>Theory building</i> emphasis	<i>Theory testing</i> emphasis
Research problem	How has technology impacted the public procurement process?	What are the drivers for change? What technology has been implemented? What activities, structures and costs are involved? What are the relationships between technology and these activities, structures and costs?
Literature review	<i>Exploratory</i> - what are the variables involved? Constructs are ‘messy’. <i>Research issues</i> .	<i>Explanatory</i> - what are the relationships between variables? Constructs have been measured before. <i>Propositions</i> .
Paradigm	Interpretive	Positivist
Methodology	Case study	Survey

Table 9 : Research Approaches in IS (adapted from Rao and Perry, 2003)

As Yin (1994) (reference Table 10, page 123) explains, given that the research is exploratory, there had to be some *a priori* theory that is used to select the case sites and the constructs to be examined.

Research Phase	Research Terminology	Theory Requirements	Potential Output	Sites Used
Benbasat et al. 1987	Yin, 1994			
Exploration	Descriptive	May be no a <i>priori theory</i> when events are examined; important constructs are not likely to be defined	Description of events and outcomes to allow other researchers to understand the processes and environment. May indicate the relative importance of some factors	Exemplar cases (with extreme or unique circumstances) or revelatory cases (first examination of the phenomenon for scientific purposes (Yin, 1989)
Hypothesis Generation	Exploratory	May have some a priori theory that is used to select case sites and the constructs to be examined	Propositions developed, based on the observations at one or more sites. Operational constructs may be refined or developed, however some of the measured constructs may not prove useful in the evolving theories (Eisenhardt, 1989)	Multiple cases that may be maximally different to highlight the commonalities and differences in the observed phenomena
Hypothesis testing	Explanatory	Theory and perhaps operational measures of constructs are defined well enough to allow hypothesis to be proposed prior to conducting site visits		Single or multiple cases that allow "pattern matching" (Yin, 1989), where the pattern of actual values of dependant variables vs. independent variables are compared to those predicted through theory; replication by investigating other sites where theory should apply
- Confirmation			Indication of theory's validity; may involve assessment of reliability and validity of measures	One or more cases selected to apply existing theories to situations where their applicability has not been tested
- Disconfirmation			Evidence that disproves one or more theories designed to explain events and outcomes in the case situations	Critical case (Yin,1989) that provides clear cut evidence that a theory is inapplicable or incorrect
				For comparing competing theories one or more cases with conditions that allow theories to be compared for their explanatory ability (Lee 1989)

Table 10 : Definitions of Research (from Mc Cutcheon and Meridith, 1993)

The output was proposals developed based on the observations at the three sites chosen. The operational constructs proposed were continually redefined and developed. It is shown in the case presentation and the discussion that the

use of multiple sites was maximally different to highlight the commonalities and differences in the observed phenomena.

4.6 Research Strategy

As stated in the previous sections, the main methodology followed is the case study, which was defined by Yin (1994) as a research methodology based on interviews. The methodology usually investigates a contemporary phenomenon within its real-life context when the boundaries between phenomenon and context are not clearly evident.

The objectives are thus set out to give a structure to the research. These are restated here for the purpose of clarity

- To show the drivers for the public procurement process in the Republic of Ireland since 1990.
- To illustrate the internal and external drivers for the introduction of technology into the public procurement process
- To map the public procurement process within the Irish Health Sector.
- To demonstrate that the procurement process can be examined as a single structural entity
- To demonstrate that technology impact on process can only be examined through an understanding of context
- To develop a conceptual framework for the assessment of the role of technology on the public procurement process

Voss, Tsikritsis and Frohlich (2002) confirm that there is a wide set of choices to be made in conducting case research. These include how many cases are to be used, case selection and sampling. Examples of single case studies exists (Schonberger, 1982; Karlson and Ahlstrom,1985). Mukherjee, Mitchell and Talkbot (2000,p.146) state that single cases may involve the study of multiple contexts within the case. Yin (1994) explains that the definition of unit of analysis (and therefore of the case) is related to the way the initial research questions have been defined. In this research the case is seen as the

procurement process within the health sector. In examining the case it was evident that there is no distinction between both current and retrospective issues. It was critical for me in determining the role of technology to examine the development of the procurement function and in parallel to examine the development of the technology being used.

One of the key issues in looking at the unit of analysis was that in the literature for both information systems and procurement, the unit of analysis ranged from the individual organisation to the individual departments within the organisation. A framework was created in order to examine the unit of analysis chosen; the procurement process. This was developed into a working model during the initial stages of the research is presented in Figure 17.

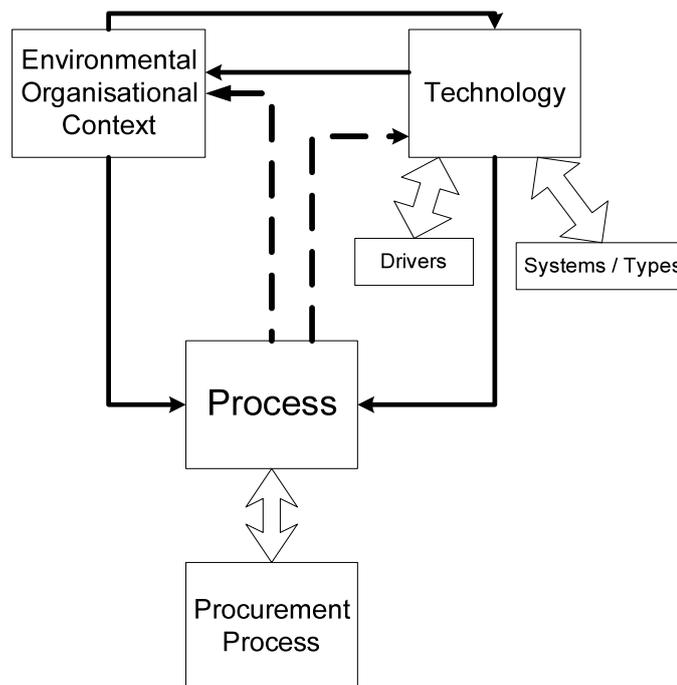


Figure 17 : The Research Model

This model used process as the structure in question and in particular the procurement process. The model illustrates how the environmental context may impact both the technology being adopted at an organisational level and also at a process level (this builds on Whittington (1992)). It also seeks to

illustrate the relationship between technology, process and the context in which all three are placed. The model as conceptualised illustrates the recurring interaction between all three elements. This recurring interaction reminds us of the recurring change of structures that Giddens (1984) references. The framework sets the unit of analysis, the procurement process, in its context. It could be viewed as an independent unit; independent of organisation, environment and technology. Further in adopting the “practice lens” for studying technology, Orlikowski (2000) outlines that the unit of analysis could be defined as an independent structure itself. I chose to define the procurement process as that an independent structure. The initial context examined builds on Harland’s conceptual model presented in section 2.10. These influences are shown at a European Union level, national level, sectoral level, agency level and finally organisational level (see Figure 18, page 127). In the research I took Harland et al.’s (2000) model and applied the influences at these different levels and showed how these influences are examined as drivers. I then used these drivers for developing the coding system used in analysing the data. This built on the concern for context as expressed by Whittington when using structuration as a basis for analysis. The emergent change of the Health Sector was analysed using Giddens (1984) framework referenced in Figure 13, page 96)

The initial coding for drivers for change are shown as D1 to D9, these are drivers of change initiated at different contextual levels. The technology is analysed under two headings; the technology changes and the technology drivers. The technology changes are seen at a global level while the technology drivers are analysed as only those changes that directly affect the process. This is seen as supporting Whittingtons (1992) assertion that contextual factors are not analysed and supports Giddens view that in order to understand these contextual factors that there needed to be an analysis at the micro and macro levels.

Further detail of the coding is given in Appendix 4. In defining the unit of analysis as the procurement process there is an issue with setting criteria for measuring success of the enquiry. Yin reasons that exploratory research design

should be clear about the criteria on which the exploration will be judged successful.

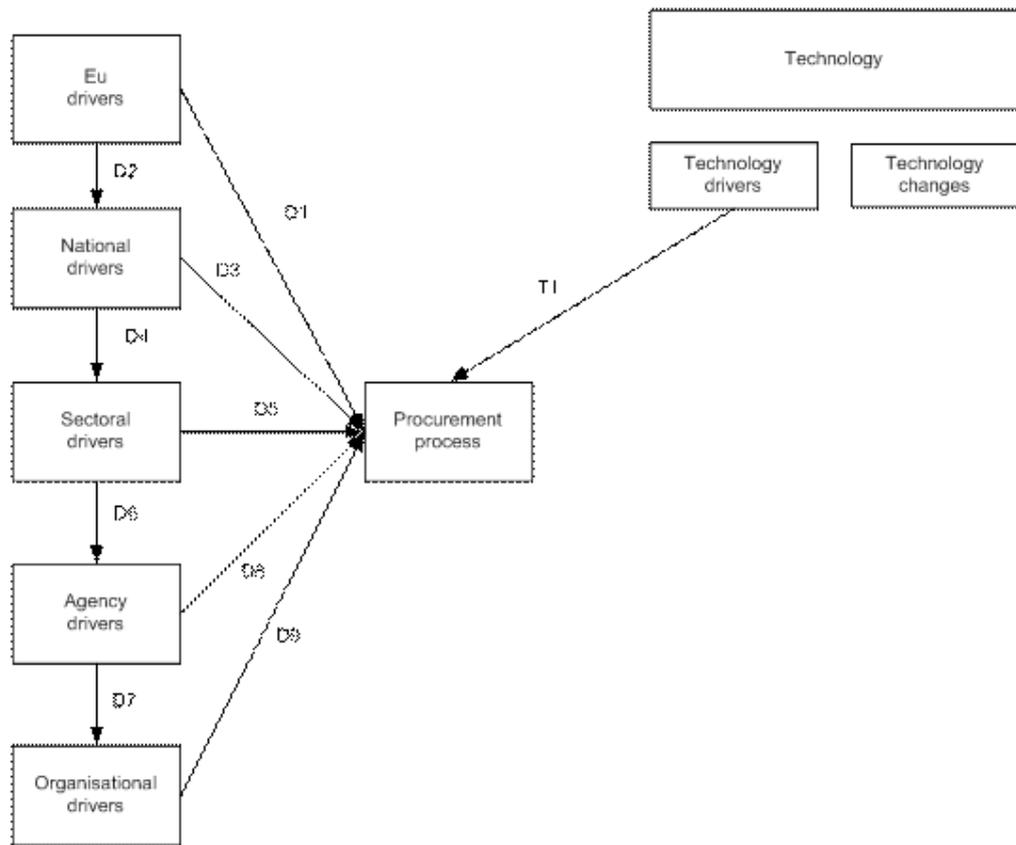


Figure 18 : Initial Coding Framework

For the purpose of the research the following criteria were chosen

- The classification of the procurement process should be generic and based on previous definitions and maps from the literature and practice
- The classification should be capable of describing the process in a variety of organisational contexts
- The extent of employment of each component of the process should be at any time capable of comparative description which can be audited

- The extent of employment of each component of the process at any time should be capable of a descriptive relationship with the context in which it is set
- Each written case study should be understandable, plausible and informative to the case participants who provided the accounts from which it was written.

Having described the overall research strategy and the measures of success, the detailed approach to the case study is illustrated in the following sections. The case study procedures are initially outlined, including the sampling criteria used. The case study protocol followed is then explained, illustrating how the records were kept and built up. Thereafter the instruments are outlined, for example the interview approaches and the focus groups approaches.

In developing the case study, it was critical that data be linked back to propositions and criteria for interpreting the findings, as these set the foundation for the analysis. In this respect Yin gives little guidance in this other than to hope that the different patterns are sufficiently contrasting. Eisenhardt (1989) suggests two approaches to this, that of 'within case analysis' and that of 'cross-pattern searches using divergent techniques'. In Section 4.8 the approaches taken to analyse the case data are fully explored. The limitations of the methodological approach are then evaluated in Section 4.10.

4.7 Sampling

Yin (2003,pp.42-43) describes how single case designs can be appropriate. He describes a number of conditions when single case design can be used, such as when the case represents a critical opportunity to test a well-formulated theory or when there is a unique or extreme case, or if it presents an extraordinary opportunity to study a phenomenon, or it is a revelatory case or finally a longitudinal case. Multiple case designs can be used for comparing different instances of the same phenomenon. This study aimed to explore the application of structuration theory in the role of technology, not on the traditional

organisation but on a process. As such it used a multiple case approach but contrasted the application of theory in two different contexts.

Using the initial conceptual framework (Figure 15, page 106) and the Research Framework (Figure 17, page 125), the cases were chosen in a specific sector, Health. The initial interviews were chosen to explore the context for setting the procurement process. Again referring to the literature review, some of the drivers of change in the area of public procurement were identified, from these documents participants in the carrying out of the analysis and in producing the reports were identified and these were interviewed to develop the axis of context. The initial research participants were selected to feed into the research objective of developing the drivers for the public procurement process in the Republic of Ireland (ROI) from the 1990's.

Yin (2003, pp.48-49) distinguishes between sampling logic, which is applied to survey design, and the replication logic of multiple case study designs, which mirrors a series of tests or experiments. He concluded that with multiple case studies, cross experiment is called for rather than within experiment design and logic.

Partington (1997, pp.65- 66) discussed the question of the ideal number of cases is complex. It was noted that at

“the practical level it relates to the time and other resources of the researcher which must be used in a trade off between the depths of analysis made possible by studying fewer cases and the possibility for replication and theoretical saturation offered by more cases” (Partington, 1997, p.66)

Yin (2003, p. 51) describes how researchers should be guided by their “sense of complexity of the realm of external validity”. In other words, in relation to this study, I found that it was the study of the process which was context specific but not organisationally bound, which needed to be articulated.

“Another question which had to be addressed as part of the overall question of the number of cases is whether the design should be multiple case-holistic or multiple-case embedded” (Yin, 2003, pp.52-53). For the purpose of this study, the latter implied that it would be better to study more than one case in the same organisation. However for this study, multiple cases were considered and therefore a holistic approach was required, where there is a comparison of models applied to study the role of technology. This enabled me to develop a detailed map of the public procurement process across the health sector.

In looking at the individual cases, the Health sector had been chosen as the most advanced in the Irish Public Sector. The individual cases were chosen as those that had documented clear processes and had been involved in consultation with the initial participants. The individuals in each of the individual cases chosen for interview were initially chosen based on the following criteria

- Do they have knowledge of the procurement process?
- Do they have responsibility for part of the procurement process?
- Do they interact with other individuals as part of that process?
- Do they interact with technology as part of that process?

The key factors for these criteria reflect that the unit of analysis was chosen to be the procurement process. The criteria also clearly support structuration theory research (Table 6, Page 91). In particular to understand large-scale institutional social phenomena of the procurement process, I clearly understood that there was a need to study the everyday practices of the relevant social actors that constitute these practices.

Taking into account these considerations, the fact that there was an iterative process being employed between the research questions and the conceptual framework the initial concept was to apply the traditional approach to a number of cases and then to modify and examine a single longitudinal case.

Partington (1997, p.60) noted “

The case selection choice facing any researcher in a multiple case design is at one extreme to define in advance every specific organisation and every incident of procurement to be studied and to conduct the studies either simultaneously or sequentially. At the other extreme is the alternative of selecting only the first case, which is completed before the second and so on.”

The second extreme has the advantage that features of each case that are important and unforeseen can allow the course of the study to be steered. Emerging theory thus controls the data collection. Miles and Huberman (1994) note the advantages of such flexibility, they point out that research studies, which are not well designed and bounded can be unfocused and unmanageable. There needs to be a clear conceptual framework otherwise the research may not go anywhere.. Miles and Huberman (1994) suggest the avoidance of both scenarios.. The approach to this research has been to construct a set of clearly defined objectives and a common analytical framework thus allowing a theoretical sampling process to operate within a defined structure.

Partington (1997, p.66) remarks, “there are two practical considerations which anyway limit case pre-selection.” First the finite and limited nature of the resources available to a doctoral student are likely to restrict the feasibility of conducting simultaneous multiple case studies. Second over the course of the work in the field which ran over 18 months for the longitudinal case it was found to be difficult to negotiate and plan access to any of the case organisations more than a few weeks in advance.

During the first year of the study, I held pre-study interviews with a number of key personnel associated with the public sector; in particular the interviews featured the implementation of technology associated with the procurement process. These included both public servants, consultants who had advised and written policy documents and members of public advisory bodies. The intended purpose of these interviews was first to practice the skill of open ended interviewing, secondly to clarify the aims of the study and thirdly and most

importantly to help identify the organisations which would be suitable for the main part of the study. The interview protocols are shown in Appendix 1.

These interviews have been used as part of the study and have been incorporated into the overall case study as written. Arising from the interviews was the conclusion that the Health Sector had the most advanced work done in its procurement area and more importantly there was a generic approach taken which had (according to the interviews) been rolled out across the sector. It was therefore decided to direct the main part of the study at the Health Sector.

The first organisation chosen was an independent hospital. It was chosen because of size and that control of the process would be within a single domain.

The subsequent organisation was chosen also for the same reason, but the longitudinal case was selected because the theory emerging from the first two cases suggested, as had the literature during the iterative process, that the process could not be examined in the context of a singular organisation, but rather needed to be examined as a singular entity in itself.

4.8 Case study procedures

Merriam (1998) describes how a qualitative enquiry focuses on meaning in context. Korbil (2005, p.112) states that such an enquiry “requires data collection instruments that are sensitive to underlying meanings during data collection and analysis.” In this research a process that as logical and rigorous was adopted as it allowed the assumptions and beliefs of the participants to be considered and for myself to formulate opinions and deeper considerations. The data was collected, analysed, then more data collected and analysed, with a number of iterations taking place in both the data collection stages and the analysis stages, allowing me to work with the assumptions and beliefs of the participants.

Interviewing, observation and analysing activities are activities central to qualitative research (Merriam, 1998, p.2). The primary data collection methods used were

- Interviews (Mason, 2002; Merriam, 1998)
- Focus Groups (Krueger & Casey, 2000; Greenbaum, 1998).

The data from the interviews and the focus groups is qualitative.

This study is based from an ontological point of view this study on the assumption that "... people's knowledge, views, understanding, interpretation, experiences and interactions are meaningful" (Mason, 2002, p.63). The epistemological point of view, which was the view taken in this study assumes that people talking interactively is a meaningful way to create data. Based on both of these views, qualitative interviewing was selected as a data-collection method. The qualitative interviewing further allows for social argument to construct depth, nuance, complexity and roundness in data (Mason,2002, p.65). The nature of structuration of emerging realities was such that continuous interaction with the data led to new structures emerging, until the final conceptual framework was drawn.

4.9 Interview Protocol

Korbel (2005, p.113) noted that in his study that "it was important to obtain and understand the perceptions of the individuals". This was also true of the participants being studied here, as I needed to understand their perceptions about the role of technology in the procurement process. Korbel (2005, p.133) noted that the advantages from doing qualitative interviews in his study were to

- "Allow the individuals freedom to create shared meaning with the researcher,
- Allow the researcher to move back and forth in time to construct the past and the future and to verify the current,

- Allow space for the surfacing of additional arguments or adding different dimensions to a perspective,
- Allow the data produced to be verified,
- Create access to the data that would not generally be accessible in other ways,
- Create understanding between the interviewer and the respondent that there can be more than one perspective of the same problem. It allowed for the appreciation of alternative views.”

The same advantages were found in this study. In particular the sharing of ideas and a mental model allowed a new paradigm for understanding the impact of technology on the procurement process. The ongoing interaction of myself with the participants allowed for verification of both the data but also the participants perspectives over a period of time, thus allowing a deeper understanding of context.

The challenges associated with doing qualitative interviews in this particular study were that

- the interviews were semi-structured and as such the data was quite large, with opinion being expressed quite frequently. Follow-up on this was required, this included checking with other participants and gaining access to documentation held in each of the organisations, as such there was less control over the data that was collected,
- although the participants were chosen because of assumed prior knowledge of the procurement process it was found that the interviewees may not have known enough about the process being examined,
- the interaction of the researcher, me, with the interviewee allowed for a common viewpoint to emerge. Transcripts were fed back to the individuals and agreement reached on the contents. Although the interviewees might have had different ontological views to that of myself, there was over the period of the interviews a convergence of viewpoints,

- Work with the external bodies on the longitudinal study may have results in only certain people being selected and as such alternative or opposing views may have been left out.

Interview data sheets were constructed for collection of the data for all participants. The initial interviews were at the context level and copies of the interview sheets and protocols used are shown in Appendix 1.

A number of data collection instruments were used to carry out the qualitative interviews with the case participants. These included

- An initial interview sheet
- A second interview sheet
- A focused group worksheet
- Process mapping and verification of maps with participants

The interview sheets are shown in Appendix 1 and the focus group sheet shown in Appendix 2.

The questions chosen for the initial interviews were based on establishing context. These reflected the specific objectives of

- To show the drivers for the public procurement process in the Republic of Ireland since 1990
- To illustrate the internal and external drivers for the introduction of technology for the public procurement process
- To demonstrate that technology impact on process can only be examined through an understanding of context

The questions chosen for the case data were developed to reflect the following research objectives

To map the public procurement process within the Irish Health Sector

When constructing case data, the types of data sets to be kept may include for example diaries, interviews, archival data and ethnographies, which may have involved either direct or indirect observation over time. A longitudinal ethnographic approach is, in theory, particularly attractive offering depth in an established way of accessing 'the meanings that give form and content to social processes' (Hamersley and Atkinson, [sic 2004] in Partington, 1997, p.68).

There were advantages offered with the use of diaries, as they would have allowed me to monitor the participant's perceptions without the need for me being present. However I discounted their use for practical reasons. Given the nature of the work and change that were occurring in the longitudinal case I felt that it would not be fair to ask a group of people independently or collectively to record their thoughts, either in writing or on audio tape, over a period of months, particularly given that this was for a doctoral student project and that I had been given confidential access.

"A research question is a prototypical epistemic referential question because it intends to provide contextual information about situations, events actions, purposes, relationships or properties" (Kearsly, 1976, p.361 in Peterson, 2000). The main instrument therefore used was as stated, a series of interviews, which comprised of mainly open but also some closed type questions to accommodate all the topics in the research. Open-ended questions allowed the study participant to put their own style on the answer. This is when insights into the context of the process were quickly established.

The interview questionnaire was designed in five separate sections:

- Organisation
 - This enabled the drivers for both the public procurement process and the drivers for the introduction of technology to be understood at a contextual level
- Role of participant
 - This was to understand the social context of the participant

- Procurement Processes
 - This contributed to the mapping of the procurement process
 - This enabled the development of the conceptual framework
- Technology Used, past, present and planned
 - This contributed to understanding the drivers specifically of technology related to the procurement process
- Impact of Technology
 - This enabled contribution to the conceptual framework for assessing the impact of technology

Care was taken with the construction of the questions themselves. A few simple rules applied when constructing the questions:

- use of words, expressions, terms or whole meanings that may differ within the study participants group were avoided
- questions that fell outside of the study participant's experience were not followed up on
- the use of 'and', 'or' were avoided
- leading questions were not used
- A biased sample was avoided

According to Peterson (2000), for a research question to provide meaningful information, a number of distinct communication-related activities must be carried out. I had to ensure that all the study participants interpreted it in the same way. An interview strategy that I had to keep in mind was characterised along two dimensions. These were "Amount of Structure" and "Degree of Directness". The amount of structure refers to whether the interview design is unstructured or structured. A completely structured interview involves asking all the study participants the same questions in the same way and in the same order. All the question answers are predetermined and only closed-end questions are used. They are used when the researcher is looking for confirmation on a topic that they want to prove is correct. The more structured the questionnaire the more the researcher must know about the process and the study participants, before construction of the research questions. The topic

here was exploratory and as such establishing the social actors understanding of their practices, it was necessary not to use these structured closed type questions.

In contrast, for completely unstructured questionnaires, every question bar question one depends on the previous answer. No two study participants are asked identical questions and the questions permit a wide variety of answers. One of the advantages of this type of questionnaire is that it is flexible, and can provide insightful information. However, it is time consuming and difficulty has been found when trying to interpret the answers. This type of unstructured questionnaire is only suitable for one-to-one interviews. This was the approach taken here, with some modification, which included using the same set of questions across multiple organisations and across multiple levels within organisations. The difficulty in adopting the complete unstructured approach here, is that it would have led to an unfocused study and as such again would have not followed the methodological approach of a bounded structure that was being built iteratively.

The degree of directness “refers to how much is disclosed to study participants about the purpose of a research project, the sponsor of the project, what the researcher hopes to learn out of the project and the nature of the questions asked” (Peterson, 2000, p.5). There are two main types depending on the degree of sensitivity of the data. These are full disclosure and projective questioning. A full disclosure was given to the study participants in this project. This meant that the study participants were told about the project, including the purpose of it. All the questions were transparent, that is they focused directly on the issues and topics of interest.

There are two types of question available to the questionnaire designer, open format and closed format. Open format permits the study participants to formulate their own style of answer. Closed format questions, on the other hand, are forced choice questions. Open questions were chosen as the key instrument here. Again this allowed for the participants to learn about the social researchers accounts of how the project worked, and as such encouraged a

more open interaction. All participants were asked if the interviews could be recorded. Where permission was granted the recording was made. Where permission was not granted or agreed, notes were taken during the interview with follow up notes also being taken directly after the interviews took place.

4.10 Focus Group Protocol

A focus group study was also carried out as part of the research approach. In the following paragraphs an outline of the approach taken to the setting up and running of the focus group and the background is covered.

For the purpose of clarity, a focus group is seen as a specially chosen group with a specific purpose to listen and help gather information on a specific topic. In the case here they were users in community services. The approach was used as a way to understand how people, particularly the users of the procurement process thought and felt about the specific phenomenon being studied. This was particularly important for the Community Service workers who participated since they had as individuals a limited view of the process. “A reasonably homogenous group of participants is selected based on specific criteria” (Greenbaum, 1998, p.2) and how they relate to the research. In the case of this study, greater than 50% of all products and services procured were procured on behalf of the community services group (see case description for further detail). This implied that there was a distinct body of people participating in the process that did not fall into any singularly defined group and so an approach had to be taken which encompassed them. This approach was to use a focus group session along with follow-up interviews. A simple definition of a focus group is

- “A carefully planned series of discussions designed to obtain perceptions on a defined area of interest in a permissive non-threatening environment “(Krueger and Casey, 2000, p.5).

A series of objectives were then set out for the focus groups following on from this definition. It was important in carrying out this research that all participants gave their permission to participate. In setting up the focus group at their work location, this enabled an environment to be established which led to trust being established between the researcher (myself) and the participants.

Korbel (2005, p.117) outlines some key objectives for undertaking focus group interviews. These were adapted and used as guidelines for setting out the objectives of the focus groups here. These objectives were to:

- Involve the community services as participants of the research project in the key data gathering phase,
- Ensure that data was collected which supported each of the research objectives
 - To map out the procurement process,
 - To develop the conceptual framework for assessment of technology,
 - To illustrate the drivers for the introduction of technology,
- Ensure that the information collected was analysed in such a way as to investigate and obtain findings for each of the research objectives
- Ensure that the researchers biases did not focus on only one area (for example materials but ignoring services) and so create a bias in the analysis.

Korbel (2005, pp. 117) goes further and highlights the advantages and challenges of carrying out a focus group study. The advantages and challenges for this study were similar, although there were specific elements that were unique to this research. The advantages of carrying out the focus group study in this research were,

- The validity of process maps for the procurement of products and services which were outside the normal organisational context were explored thus allowing the participants to share and respond to ideas and

practices that they would not have seen previously and helping the researcher to explain and explore research question,

- A number of points of view emerged from both the delivery of the community services and their management, which may not have happened in one on one interviews
- Because of the choice of location for the focus group, the participants were encouraged to relax and participate in the conversation
- The structured approach provided rigour for enabling trusted results, as did the follow up sessions to confirm the findings of the focus groups.

There were a number of challenges faced in setting up and running the focus group. These included

- The participants were seen to be clearly outside the standard organisational context and not aware of all information, and as such this encouraged them to speak openly and freely and to relax. However dominance of speakers had to be managed to maintain this openness.
- A simple ice-breaking exercise was run, whereby all of the participants were asked to identify services and products that had been procured within their area within the last 12 months. This gave a common language and common understanding of the boundaries of the group. More importantly it enable a rapport to be developed that enabled further sharing of information.
- The purpose of the group had to be kept clear at all times in order to prevent it from turning into an unfocused non-productive session that could have led the group in the wrong direction. This involved facilitation skills, which were necessary to ensure the successful outcome of the study.

4.11 Process of Data Collection

This study involved a focused examination of the procurement process. In order to carry out the examination the data collection instruments, of interview, focus group and secondary documentation had to be brought together. This occurred iteratively both in the data collection and in the data analysis.

The data collection and analysis process happened in three distinct phases

- Phase 1 Interviews and focus groups: this involved preparing outline notes, workshop guidelines and data collection instruments including voice recorders and notebooks
- Phase 2 Interview data collection and focus group data collection. Once the sets of data were collected this data then had to be analysed, verified. Where necessary there was clarification. Throughout all the interviews and focus groups notes were taken on the observed data for example mood of the participants.
- Phase 3 Closure of the process was the final step and involved interviews with senior management in all cases.

Appendix 5 shows the interviewees, the organisations, whether the interview was recorded, transcribed or non-recorded and notes amended. The table also includes the work done for the focus group carried out in community services.

Each interview lasted between 45 minutes and 2 hours depending on the organisation involved. In the case of the longitudinal case multiple interviews were carried out with the interviewees over an 18 month period as well as noted observations, sitting in on meetings, shared documents and minutes. Where possible all interviews were recorded and transcribed, some participants asked for the interviews not to be recorded and their request was adhered to.

All organisations asked to remain confidential and in the two cases all parties involved signed confidentiality agreements. Coding of interviewee names was such that it involved the initials, location and organisation. The central government access was over a period of three interviews. The consultancy access was to former senior consultants who had been involved in the major strategy documents that were used for triangulation on developments in the sector.

4.12 Case study analysis

Analysing case study evidence has become easier with the development of textual analysis tools, however in approach and planning it is still one of the least developed and most difficult aspects of doing case studies (Yin, 1994). Data analysis consists of examining, categorising, tabulating or recombining the evidence to address the research question. It can also involve a variety of other techniques including

- Putting information into arrays
- Making a matrix of categories and placing empirical data within the categories
- Creating flowcharts or other kinds of display for examining the data
- Tabulating the frequency of occurrence of different pieces of data
- Using a timeline as a device to establish the temporal order of events

Miles and Huberman (2004, p.9) suggest a more general approach

- “Affixing codes to a set of field notes drawn from observations or interviews
- Noting reflections or other remarks in the margins

- Sorting and sifting through these materials to identify similar phrases, relationships between variables, patterns, themes, distinct differences between subgroups and common sequences
- Isolating patterns and processes, commonalities and differences and taking them out to the field in the next wave of data collection
- Gradually elaborating a small set of generalisations that cover inconsistencies discerned in the database
- Confronting these generalisations with a formalised body of knowledge in the form of constructs or theories. “

Yin (2003) points out five main modes of analysis

- Pattern Matching
- Explanation Building
- Time series analysis
- Logic Models
- Cross Case Synthesis

In the first approach, the empirical based patterns are compared with those driven out from the theoretical propositions. In the second approach there is a more specialised pattern matching, but the case study data is analysed by building an explanation about the case. Glaser and Strauss (1967) cite a similar procedure in their grounded theory approach to exploratory case studies. The third approach is to examine the data for a trend, be that trend theoretically driven, a rival trend or any other type of trend based on artefacts. The fourth approach is a combination of pattern matching and time-series analysis. The fifth approach is used where there is more than one case.

The analysis of the data was carried out in the following way. For this research each interview was tape recorded and transcribed. Where approval for transcription was not given, notes were taken and additional notes added at the

end of the interview. These transcripts, the notes and other documentation received, formed the material for subsequent analysis.

It was proposed to use a software tool called NVIVO to help with the analysis of the data. However, after initial trials it was decided to discontinue with this analysis. The decision was also informed by a consideration of previous work (Fielding and Lee, 1991; Robson, 1993; Cresswell, 1998). It was determined that the advantages of the software (e.g. convenience, consistency of approach) were outweighed by the disadvantages e.g. inflexibility. The additional documentation e.g. process flows drawn and annotated during the interviews and focus group could also not be captured within the software package. Further the software would place the process before the task and as such would not aid in developing the analysis needed. Hence Microsoft word was used along with Mindmanager mind mapping software. The Mindmanager software allowed visualisation of categories and so enabled easier analysis of complex relationships within the data.

Data reduction was carried out in two stages to minimise loss of detail with the interviews and additional documentation:

- Each interview transcript was annotated using handwritten notes made at the time of the interview, whilst re-listening to the original interview tape. At this stage, each question and answer was annotated to explain its purpose and interpretation.
- Each annotated interview was then coded using a coding matrix. The coding matrix reflected the objectives and sub-objectives mentioned previously and it also reflected the model approach listed in figure 17, page 125 (see Appendix 4 for initial coding list used).

Typically, 20 to 30 statements were derived from each interview. This coding analysis was recorded in tabular format. Qualitative comments were also included on these sheets. The development of the analysis template went through stages as each case was analysed. One of the most important

elements of this development was the mapping of the sub objectives back to the main objectives of the research. This only became clear as the data from all documents (both secondary and primary) were combined.

For each of the three main cases, the coding was summated and the summated data and qualitative comments were used to construct a narrative description for each case.

The data was gathered, reduced and analysed in a manner both to optimise insight and reduce bias. The final presentation of the data reflects the models chosen for establishing context and structure as set out in Chapters 2 and 3, i.e. Figures 10, 12 and 13.

4.13 Assessment of Validity

Validity can mean ‘...the extent to which an account accurately represents the social phenomena to which it refers’ (Hamersley, 1991, p.57). Case studies are generally criticised for failing to meet criteria for scientific, quantitative, research namely; study reliability, construct validity, internal validity and external validity (Yin, 1994).

Silverman (2006, pp.290-291) argues that there are perhaps five forms of criteria for assessing validity, which may include

- The impact of the researcher on the setting
- The values of the researcher
- The truth status of the respondents account
- Comparing different kinds of data and different methods, often called triangulation
- Taking ones findings back to the respondents.

Guba and Lincoln (1994, p.300) argue that the criteria for validity can include confirmability, credibility, transferability and dependability.

What is clear is that there is an active debate about how to judge qualitative research.

There are according to Saunders et al (2000, p.157) a number of threats to validity. These include history, testing, instrumentation, mortality and maturation

So the question still remains how can a qualitative study be tested for validity if it does not use formalised sampling methods? How can the reliability and rigour of qualitative data be judged when there is no mechanism for carrying out statistical testing? Seale (1999 p.43), focusing on the trustworthiness of a study stated that 'the trustworthiness of a research report lies at the heart of issues conventionally discussed as validity and reliability'.

Multiple sources of evidence, the creation of a case study database and maintaining a chain of evidence should be adopted as principles of good practice (Yin, 1994).

For this study, I created a case study database with various artefacts. For each case, a case study protocol was developed, enabling an independent person to establish a peer review or an audit on the research process followed (Yin, 1994; Stake, 1995). This case study protocol was subject to review prior to the conduct of the first case study. The results of each case study consisting of transcripts, recordings, accessed documentation and approved case study report were then archived.

In the study, different sources of data were looked at, in order to triangulate the evidence (Yin 1994; Stake, 1995). Data collection methods used, were interviews and focus groups as primary sources and documentation as a secondary source. I established a chain of evidence so that the route of data could be tracked to its sources (Yin, 1994). Finally the draft version of each case study report was reviewed within the organisations. The analysis of the cases was reviewed by participating organisations and two independent reviewers.

Internal validity is defined as being of concern in casual and explanatory studies of the relationship between different events. This can be demonstrated by sound argument even if the evidence is incomplete. Both pattern matching and explanation building are used here to check for internal validity.

External validity is a concern, with the question of whether the results of the study can be generalised beyond the specific research context in which it was conducted. In other words can it be applied to the wider context beyond the immediate research environment (Bryman, 1989; Remenyi et al., 1998)? To deal with this problem multiple organisations were examined. The conceptual framework was used as a basis for class teaching at master's level to procurement professionals. The procurement process itself formed the foundation for the government publication '10 step guide to procurement of innovation', published in July 2009.

The use of multiple sources of evidence and reviews were considered appropriate instruments to assure the quality of the interpretations made. Feedback from peers through the continuous presentation of ongoing findings at conferences, allowed for the development of the models and final presentation of results. Again reflecting the underlying role of structuration, the final presentation was the result of an ongoing recurring interaction with both the participants (social actors in the public procurement context) of the project, and peers (social actors in the academic process) to present a final set of data. This again is only one stage, and ongoing development of the final conceptual model is to be explored as laid out in Chapter 7.

4.14 Limitations of Methodological Approach

It is rare to be able to optimise the design of a research programme at its outset. It is often the case that time and cost constraints will result in a research strategy that is academically sound but not all encompassing. The research project was a learning experience and as such it is always possible to say with

hindsight that things could have been done better. In this section some of the issues of methodology that occurred over the course of the research were considered. The methodology was obviously limited by the epistemological stance taken, which in this case was an inductive approach. The study was not ethnographic, even though it took a longitudinal approach; it gave instead a broad overview of the current process in a given context so reflecting the underlying role of structuration in the approach taken. This is a limitation that is considered justifiable given the timeframe and research aims of the study.

The whole process of designing the research questions and operationalisation of the research variables is ultimately a subjective process, backed up by theoretical argument. It is of limited use to those who might adopt a different approach to a similar problem. By the nature of the phenomenon being studied, it is difficult to get quantitative data, hence the use of the qualitative approach. However issues of validity and reliability in designing the research instruments have been addressed as far as possible. Limitations do remain however, such as the study being only generalisable within the public sector.

In any study it is always desirable to have more data than less, provided the data is of requisite quality. This study was based on a limited population, so sample sizes could not have been large, nor could there have been an increase in case studies, which would have added any further to the theory.

Methodological limitations can be as a result of time and resource, but can also be due to ethical issues uncovered by the research. These issues are addressed in the next section.

4.15 Ethical Considerations

There were a number of ethical issues that had to be taken into account. These arose during the design, development and implementation of the qualitative interview (Mason, 2002; Henning et al., 2004). They are described in the next few paragraphs.

Consent to participate was sought from the institutional managers where the process was being examined; this included all of the case organisations. The participants for both the interviews and the focus groups then had to give their informed consent, stating they were happy to take part in the research. It was made clear to all participants that both the privacy and the confidentiality and sensitivity of the information that would be gathered would be protected, and what the research outcomes were expected to be, and how the research would be used. Consent for participation was given by the invitee responding to a request for an interview or to take part in the focus group.

A confidentiality agreement was signed and agreed between all participating organisations and myself. All data gathered was treated with discretion. There were assurances given to all participants that no individual could be implicated or identified in the publication of the results or the final work.

It was important to create an environment that allowed for the participants to share information freely through the interviews and focus groups. This enabled high quality data to be collected and collated. This was an important element of carrying out the interviews. As the senior manager present was also a participant all respondents for the longitudinal study were assured of confidentiality. It was important to me that the participants were able to enjoy the process of either the interview or the focus group and felt they also benefited from it. This was accomplished with feedback sessions at the end of the formal data collection process.

There were a number of ethical considerations that had to be taken into account when running the focus group, these for example included ensuring that no one felt intimidated and that no one felt excluded. The ethics of the focus groups were knowingly approached. Great care was taken to respect all the participants that played a role during the focus groups.

4.16 Chapter Summary

In this chapter the basic assumptions underpinning the research have been explained and evaluated. The debate of research philosophy has been built on the previous background and experience brought throughout the course of the research project. The approach taken to the design of the research and a justification of the methodology chosen was then covered in the sections 4.4 and 4.5. Section 4.6 described in some detail the research strategy, while sections 4.7 and 4.8 outlined the procedures and protocols implemented during the research. A brief discussion was then given on the limitations of the research along with a discussion of validity in sections 4.9 and 4.10. Finally the ethical considerations taken into account when conducting the study were explored in section 4.11. The debate over influence of epistemological viewpoint and research strategy adopted continues to be far ranging and stimulating.

Chapter 5 presents the results in the form of a narrative of the cases studied. It builds on the research strategy chosen and the epistemological approach debated throughout Chapter 4. Chapter 5 illustrates the cases investigated and the context for the procurement process in the Irish Health Sector. The results presented are in a form that allows for the context, the structure of the organisation and process and the role of technology to be demonstrated. Chapter 5 is a final result of many iterations of analysis and presentation of the results over the research timeframe.

Chapter 5 Results

5.1 Introduction

This chapter sets out the results of the case studies carried out. In Section 5.2 the context in which the conceptual model is proposed is described. Firstly this is described at a national level showing the influence from the European Union. Secondly it is set out in a specific sectoral context that of the Health Sector. This follows the model set out in Figure 18 (page 127). A second set of analysis is carried out using Giddens' dimensions of social change' model (set out in Figure 12, page 95). This analysis sets out the context and the development of the sector over the period of analysis in question. In the presentation of each of the cases, they are first described in a narrative form. The structure of each of these narratives is to describe the context in which the procurement takes place. This involves a description of the background to the case. The second set of analysis uses Giddens' dimensions of the duality of structure model' to focus on the independence of structure of the procurement process. The procurement process as described in Section 2.9, is then outlined with attention being paid to the three areas of influence; the environment, the technology and the process. This analysis following the conceptual model set out in Figure 17, page 125. The analysis of the procurement process is illustrated with explanations and illustrations that have been drawn from the interviews carried out across the sector. Underlying the results are the conceptual models shown in Chapters 2, 3 and 4. The linking of both the contextual analysis and the process analysis through multiple models is critical in the development of the framework. The discussion of the interactions across the cases is described in Chapter 6.

5.2 Background to Irish Public Sector Procurement

In Ireland there has been considerable change in practices and processes over the past 10 years with the modernisation of the public sector. Programs such as

the Strategic Management Initiative, Management Information Framework and more recently the Benchmarking review have brought the processes of the public sector into the public forum. In recent times there has also been a growing public awareness of procurement in the Irish public sector. Unfortunately this has been due to investigations into the procurement procedures rather than an awareness of the importance of the sector as a whole. In Ireland the total non-payroll spend (excluding commercial state bodies), for the public sector is approximately €8.5 billion (E-Procurement Strategy, 2001). Of this approximately €4.5 billion is spent on supplies and services, with the remaining amount being allocated to works procurement. The E-procurement strategy was carried out by Price Waterhouse Coopers (PWC).

“...this was a national strategy which actually would ultimately be implemented, would have to be implemented by the sectors, rather...like the people who commissioned the study were not going to implement the study to a large extent. They were not going to affect the strategy. They were going to identify measures, which would be implemented in the Health Sector, or in the Education Sector, the Local Authority Sector. So the recommendations and the actions had to be very high level. They had to be so general so that they could be applied across a sector. They could not be specific to any particular sector or they could not be specific to any particular product, for example...”

PKIBCON

The most developed area of procurement in the public sector was seen as the Health Sector and with perhaps Education being seen as the second most developed.

“...There was little or no knowledge in this area in the public sector with minor exceptions, and those exceptions were primarily in the Health Sector and a little bit in the Education. But elsewhere in the public sector, there was no knowledge or experience of procurement practices or what constitutes good practice. And therefore it was primarily up to us (The Consultants), coming up with our own set of recommendations which are based on global methodologies that we have. And then putting them out and getting feedback from them, which the main feedback in that area would have been the degree of applicability or

otherwise of these things to a public sector environment because a lot of them would have had a private sector background...”

PKIBCON

But even three years after the publication of the strategy there was

“... very little progress...as regards a coherent implementation of the technology in the strategy, very little has happened. Possibly correctly so, and the reason correctly so is that the fundamentals are not in place, the fundamentals being the procurement skills, organisation and the practices...”

PKIBCON

In the area of Health specifically, an increased interest in the delivery of better service as well as better value for money was seen. More specifically, the Health Sector went through structural changes (e.g. Brennan Report, Prospectus Report), which promised and are now delivering the framework of governance. An example of this was the establishment of the Health Services Executive that took place halfway through the longitudinal study in January 2005.

In the area of procurement itself, the development of the area of procurement was brought about through the development of the Regional Materials Management (1996) structure, the introduction of the Health Board Executive (2002), and more recently the publication of a Health Procurement Strategy (2003).

“...the health sector has made fairly good progress...not to any extent in E-procurement but in improved procurement practices...the Health sector has done a number of projects...procuring, catalogue management strategies, catalogue development programmes. And including analysis spending...the disappointing thing has been the funding because the funding that was recommended has not transpired, even when we moved in the Health Strategy. There was funding given for a Health Procurement Strategy. When we did that, we came out with recommendations on projects to be implemented and funding

requirement ...went to finance to get funding and they were given like X divided by ten type of thing. They were given enough funding to small pieces..."

PKIBCON

Recent reports on organisation and financial management have demanded an even greater focus on value for money and "lean" thinking across the service. The Commission on Financial Management and Control Systems in the Health Service recommended that *'there needs to be an accelerated program of investment in information systems to extend SAP and PPARS⁴ to all major spending agencies'* (January 2003). Furthermore they made as a key recommendation that a number of agencies in the Health system should be consolidated, stating that *'there is scope for delivering many of the support services (payroll, accounting, information technology, systems development, procurement etc) through a single shared services unit within the system or outsourced by way of public/private partnership.'*

These actions and changes should have brought about a review of the current supply strategies that are in use. But although work had been carried out by the Health Board Executive (HeBE) in the area of procurement and materials management, it was focused on services and materials being delivered through the current Health Board Structures at the time.

"... the strategy document (The Health Procurement Strategy) has brought a focus to the sector...although work is still more reactive than proactive, there is still a growing recognition of the strategic nature of the process...It has also been recognised that contract management has not been seen as part of the procurement function, but it is now being regarded as integral to it...there is still more emphasis on budget management and financial management issues than there is on relationships..."

LSHBMM

⁴ SAP – trademark enterprise resource planning system; PPARs- Payroll and Personnel and Resource Management System

But what led to these changes and this focus on technology. An initial overview has been taken of the Irish Public Sector and some of the key drivers. The Sector has, as a whole undergone, a number of major changes, most noticeably the implementation of the Strategic Management Initiative which brought a focus to customer service provision, transparency in operations and the introduction of performance management systems. The '80's and early 90's were periods of economic recession and as such there was underinvestment in the Irish public sector, most notably the Health Sector (Wren, 2003). With the boom of the '90's and the "Celtic tiger" at its fiercest the unspoken policy adopted was to continue with the under investment of the sector and to encourage a growth in the provision of private sector health services. More recently (2001), the introduction of the Health strategy looked at the ideas of quality and fairness, in particular at providing a more focused customer service.

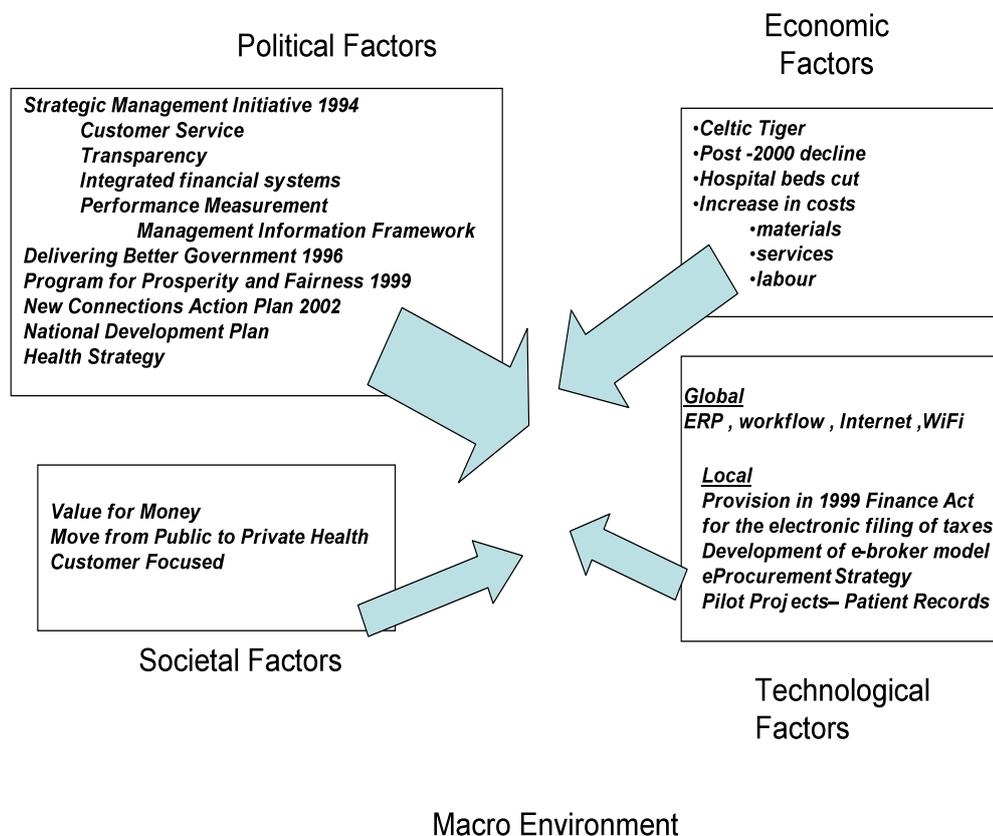


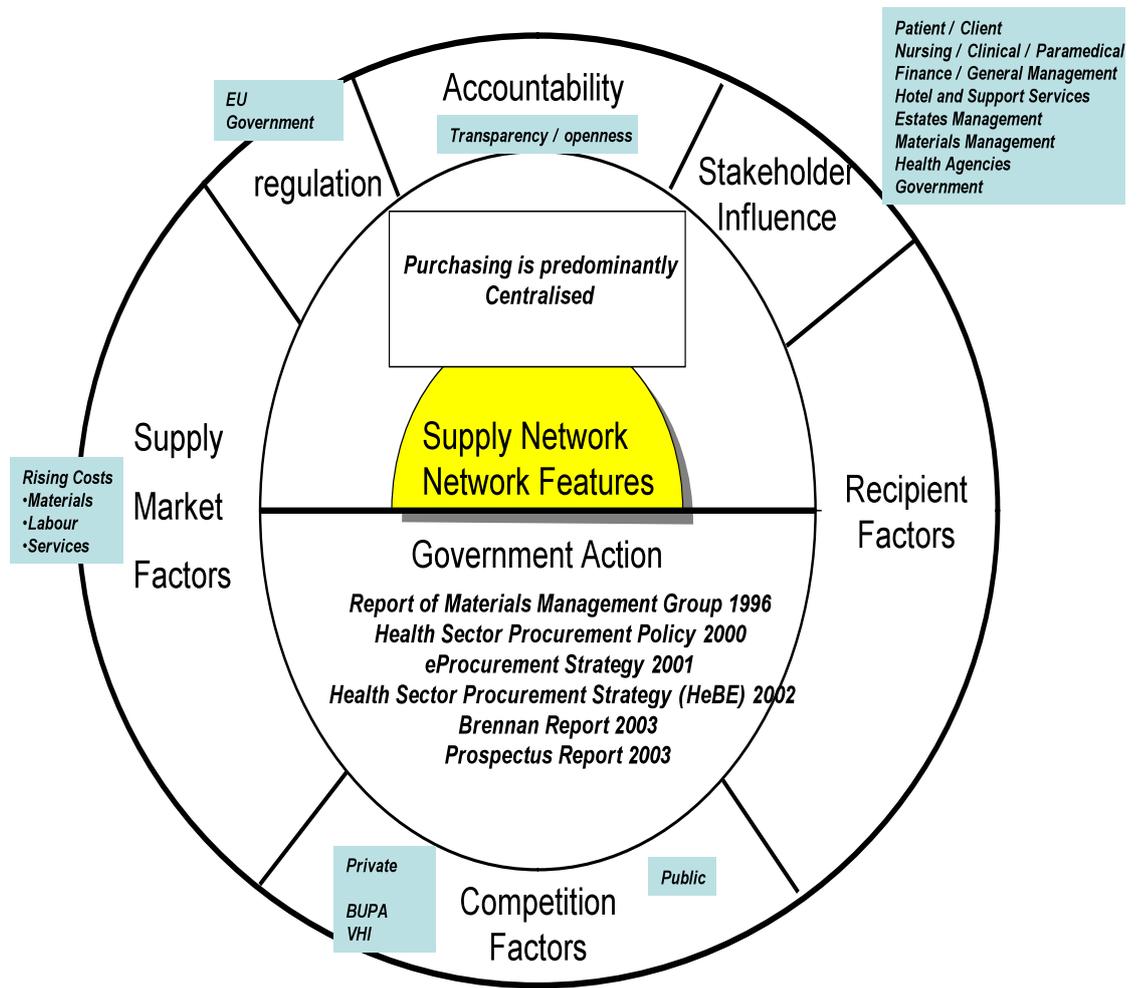
Figure 19 : STEP Analysis of Irish Health Sector

During the 1990's and the early 2000's the Irish public sector underwent major changes. Figure 19 summarises the main changes that occurred. The first thing to note is that there was greater emphasis on change brought about by political factors than by social or technological factors. The second things to note is that due to the boom of the 1990's there was an increased spend, but with costs increasing in the health sector the impact of much of the spending was not clearly evidenced. The key to many information systems being introduced was the rollout throughout the public sector of the Strategic Management Initiative (which was part of the political impetus for change). However with a change in government in the mid 1990's and the introduction of a stable coalition with privatisation high on the agenda, the move from public to private health care was given impetus. The Health Strategy and its implementation increased pressure to deliver on 'open government' and as such there was a drive to improve 'value for money' (Marshall, 2002), from procurement, firstly to support the introduction of open and fair competition and secondly to provide greater service to customers. There has also been through the EC Directives (92/50/EEC in particular) a drive to move from local, national procurement to a more international procurement. Parallel to these developments has been the rollout of technology throughout the public sector. This has been initially in support of the Strategic Management Initiative and more specifically the implementation of standard financial reporting.

Figure 20 (page 158) gives an overview of the microenvironment for the Irish Health Sector. Throughout the 1990's the growth in influence of EU legislation through the introduction of the procurement directives brought about greater regulation to procurement in the sector than had previously been seen. There was a level of investment in consultancy bodies that carried out a number of major reports (see Government Action in Figure 20). These reports became indicative of the policy being adopted during this period of investing in the report but not investing in the actual process or the technology. One of the main areas of note is the supply market factors. During this time the price paid for materials and services grew. Health costs soared with an on average inflation rate in double figures. This put more pressure on the procurement function to manage

costs. Competition came into the marketplace in terms of Health Insurance. Although there is a major public sector spend on health there is a large proportion of the population who have private health care cover. This has been seen as one of the drivers of increase in health inflation.

It has been mentioned that recent reports (Financial Management in a Reformed Public Service, Report on Performance Indicators - April 2004) on organisation and financial management have demanded an even greater focus



Adapted Harland (2001)

Figure 20 : Overview of Micro Environment of Irish Health Sector

on value for money and in particular “lean” thinking across the service. This has led to two major developments. The first development has been the growth of

Enterprise Resource Planning (ERP) systems in use throughout the public sector in general. Although the choice of systems has varied from one sector to another, with for example local government focused on using Agresso (www.mentec.com) for their financial management module and the health sector standardising for their financial module through the use of SAP. Further change was brought about when the decision was made to implement a standard financial management system. This decision however

“...does (at the time) not necessarily reflect the thinking on the ground...”

LSHBMM

The adoption of SAP was based on a set of circumstances rather than a straightforward decision. The South Eastern Health Board went to tender for an IT system. The last two suppliers remaining in the tender process were IBM and PWC. These two organisations merged during the tender process and the tender was never completed. The Southern Health board approached SAP, looked at current arrangements where SAP had been implemented (the Midland Health Board, and North Eastern Health Board had already implemented SAP financials for example) and under current (at the time) contractual arrangement set up a national strategy for the roll out of SAP. They sought two partners and eventually appointed Deloitte for the strategy and IBM for the implementation.

Secondly there was a move by all agencies across the sector to the use of a single portal (web-based) for procurement for public tenders; this has been seen as a move away from the use of local or national papers to advertise.

The Health Sector itself as structured is complex. Traditionally the Department of Health has held responsibility for both policy and budgetary considerations, although contractual relationships were held at an agency level. In January of 2005, the Health Services Executive (HSE) took control of the budgetary and operational duties. Historically this was the first time that a single body had been responsible for the whole Health Service. The structures outlined in Figure 21 (page 160) continued to exist through the longitudinal study and had been anticipated in the first two cases.

The sector procured through a number of agencies including the Health Boards, The Healthcare Materials Management Board, Hospital Procurement Services Group, 29 Public Voluntary Hospitals, the Department of Health, the Regional Materials Management Groups and the Health Board Executive and then the HSE. The Health Board Executive was set up by the Minister for Health and Children.

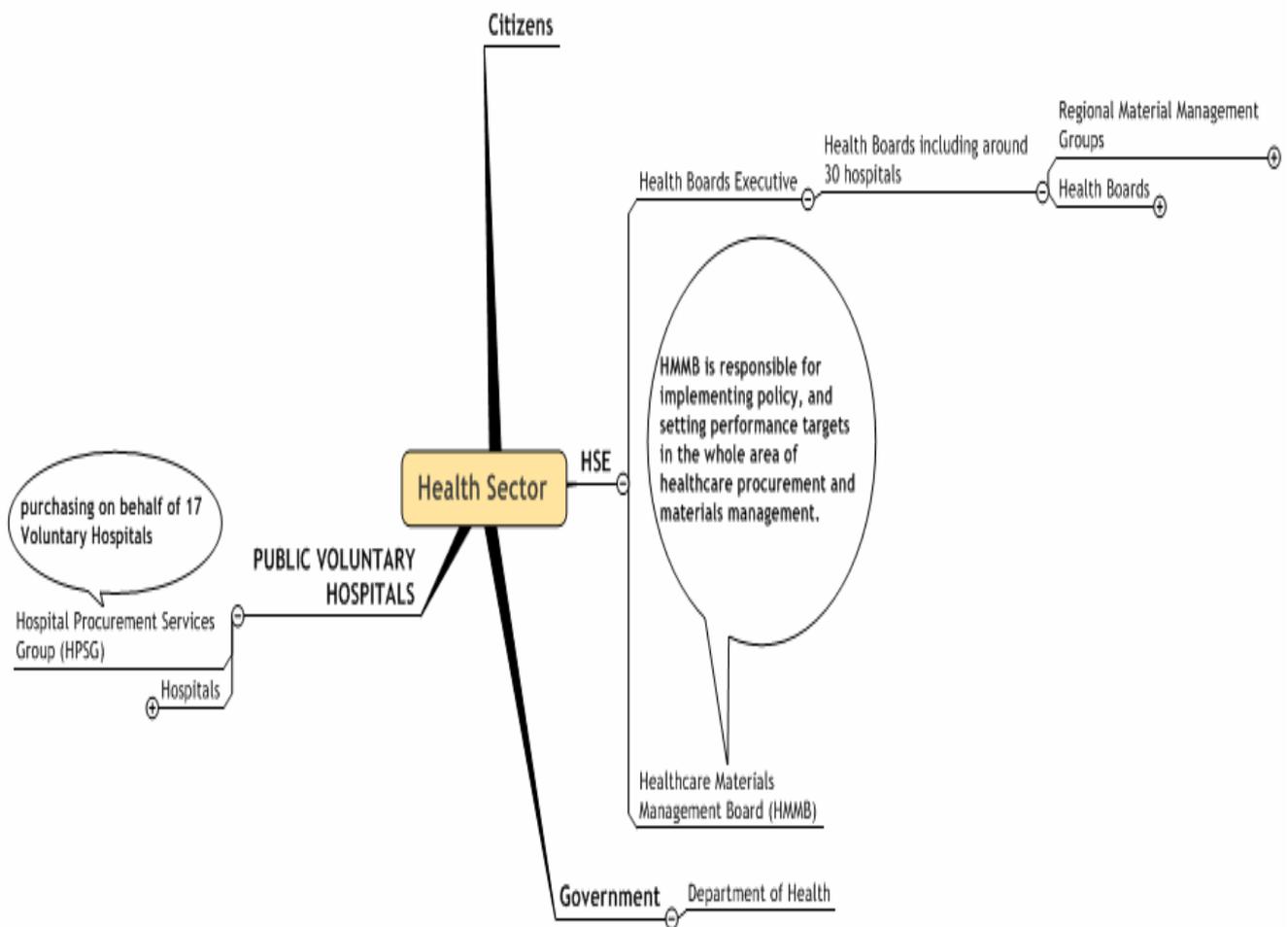


Figure 21 : Overview of Health Sector Structure

At the time of writing the thesis the board comprised the chief executives of the seven health boards in Ireland, the Eastern Regional Health Authority and its three area health boards. It was established to enable joint working between Health Agencies. This has now been subsumed into the HSE. Although the Regional Materials Management Groups and in particular the Regional Materials Manager will continue to be as they have been to date the principal

initiators / interpreters of purchasing policy and procedures in the Health Agencies in Ireland. Previously reporting to the individual boards it has been proposed that these groups now report to an Assistant Director, responsible for procurement and value for money, who in turn will report into the Finance Director on the HSE Board.

In reviewing the current procurement and supply structures it was decided to examine the following areas, National, Health Board and Regional Materials Management, and Independent Hospitals. Firstly this follows a conceptual model (proposed by Harland, 1996 and used by Davis, 2005) of looking at central level first then moving to sectoral then to organisational level. Three examples are given below of simplified structures for a number of different organisations that currently exist within the Health Sector.

Figure 22 (page 162) illustrates the overall structure being implemented under the HSE. The majority of supplies will be dealt with through structures that currently exist i.e. the materials management groups. However it is proposed that the transaction elements of requisitioning and ordering would take place through the shared services centre being proposed. Reporting to the Finance Director and not to the CEO of the individual boards, the reporting structure of procurement will have changed. It is also worth noting that the budget holder, who has the legal responsibility for the procurement, does not feature as part of the procurement structures. There is a clear delineation between procurement, materials management and the budget holder.

In looking at the cases under review, the materials management groups currently report to the CEO of the Health Board and not directly to Finance. They have responsibility for the materials management functions and the contracts management. Figure 23 (page 163) illustrates the longitudinal case where research was carried out. Spend is split evenly between main services e.g. Acute Hospitals and community services. A little over forty percent of the overall spend is managed through contracts placed centrally by the RMMG, the balance being placed by the various groupings in both community services and acute hospitals.

It is worth noting that the National Shared Services at the time of writing was going to be responsible for delivering efficiencies and greater effectiveness in the administration of the health service through transforming processing activities in Finance, Procurement, ICT, Human Resources and the Primary Care Reimbursement Service (GMS).

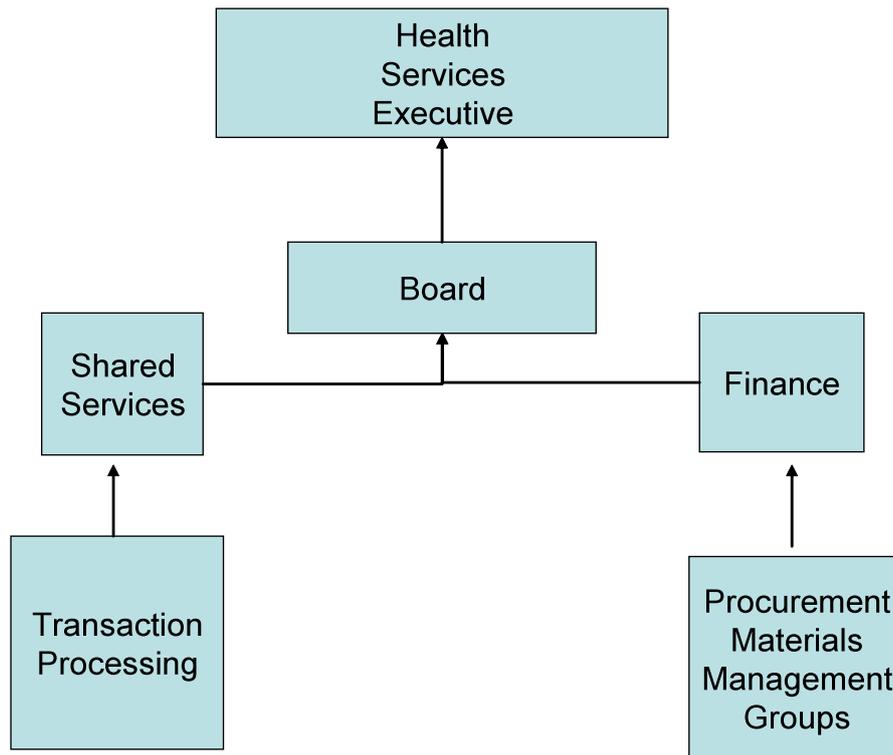


Figure 22 : Overview of the Structure of the Health Services Sector

While the procurement section was going to deliver efficiency through the management of five major (in excess of €100m p.a.) categories of expenditure: These included

- Medical Equipment, Supplies and Services including orthopaedic, renal dialysis, dental, ophthalmic, cardiac, medical gases, radiotherapy, continence products and aids and appliances
- Drugs and Medicines including vaccines

- Facilities Management including construction, engineering, security, horticulture and waste management
- Professional Services including medical, accounting, legal and management
- Health Services involving outside agencies

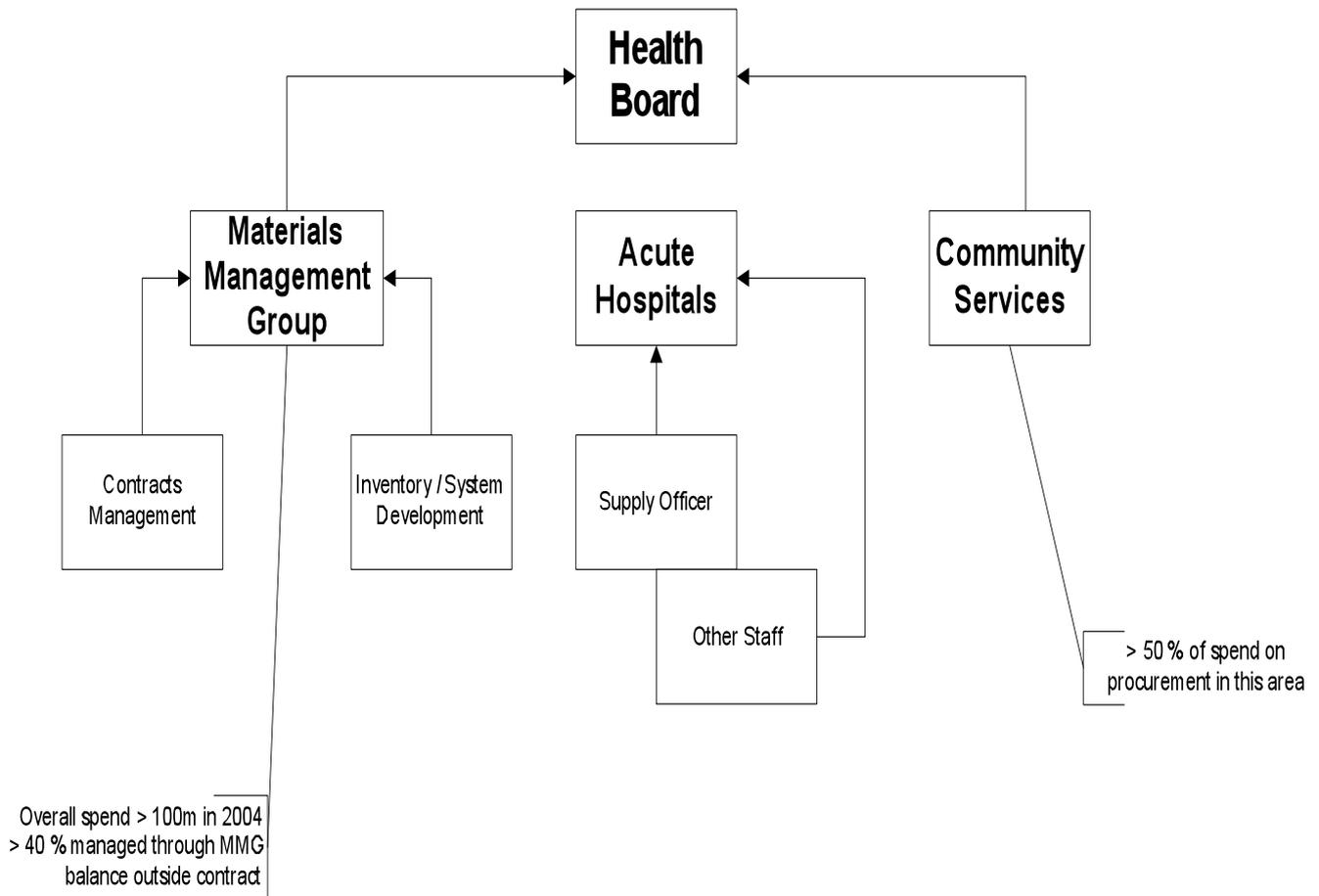


Figure 23 : Health Board Structure

In looking at the third structure present, the cases presented were of independent hospitals operating within the Health Sector. Two options are presented that of the procurement function reporting directly to the CEO or reporting to the Finance Director (Figure 24, page 164). Within the procurement function there are two distinct entities, that of supplies management and that of

contract management. This is similar in structure to the RMM groups and this policy of splitting the two functions seems to be common throughout the sector. Budgets here can vary from less than €2million to more than €50 million depending on the size and type of hospital in question. All groupings so far seen have chosen not to place procurement or supply management at the board level; rather they exist at either the level of assistant director or in the main at senior management level in all of the organisations examined.

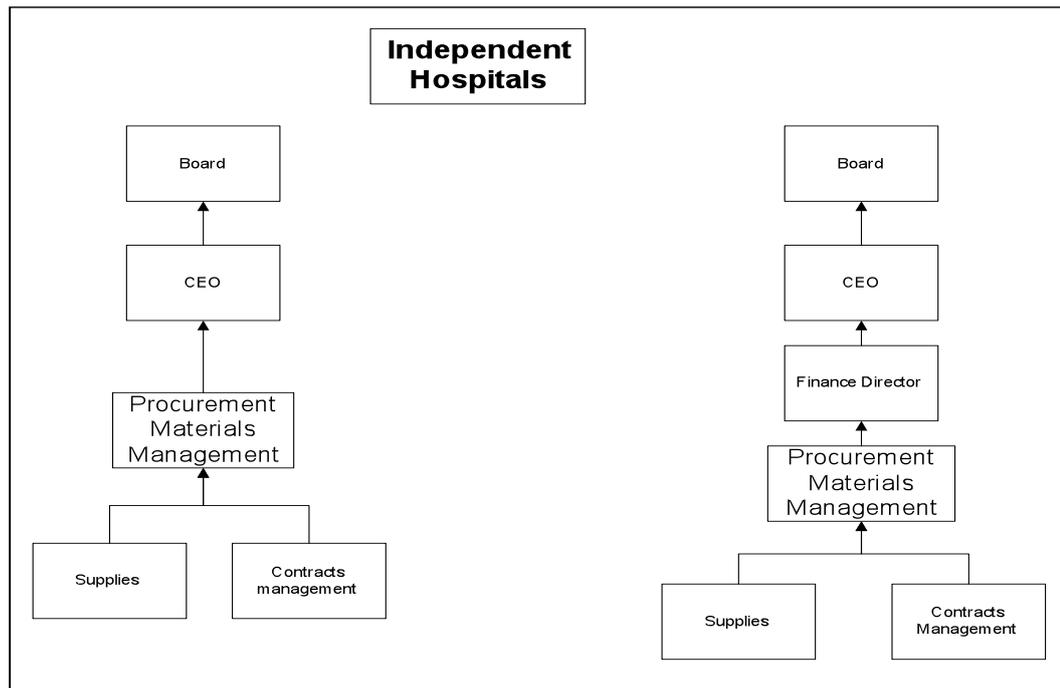


Figure 24 : Independent Hospitals Structure

5.3 Sectoral Analysis

In the previous narrative it was clear that there was direct influence on the sector at both a National and European Union Level. In using the framework outlined in Figure 17 (page125) it became obvious that there were gaps to understanding how the sector was changing. Table 11 illustrates some of the initial analysis and the drivers that influenced the procurement process

Drivers of Change				
EU	National	Sectoral	Agency	Organisational
<ul style="list-style-type: none"> • EU Directives 	<ul style="list-style-type: none"> • SMI Initiative • Delivering Better Government • National Development Plan • E-procurement strategy 	<ul style="list-style-type: none"> • Health Sector Procurement Policy • HSE established 	RMMG established	<ul style="list-style-type: none"> • TIM • Centralisation of files

Table 11 : Examples of Drivers

The model quite clearly showed the direct influences but did not show the subjective influences that were shaping the sector. Adopting Rose and Hackneys model, from Figure 13, page 96 allowed for the mapping of marked periods of change and for these changes to be captured. These initial findings were developed from the coding system discussed in Chapter 4. These findings are presented in Table 12 (page 166). The table captures the underinvestment in Health since the 1980's and shows how there has been a continuous changing of structures since the 1970's. The main areas of note are the trajectory of the sector with a continuation of the structural changes seen in the 1970's. The sector is now moving back from a decentralised system to a more centralised structure. This is borne out by the earlier results shown in the Figures 19 and 20 (pages 156 and 158)

The sector, over the course of the study, went through a remarkable change. The first standalone independent Health Agency was created and the local control mechanisms were being removed throughout the course of the study. At the same time of implementation of the HSE structure, there was a public outcry at overspending in technology projects. This caused work to be halted in areas of procurement. Examples of this were the development of a national Materials Master, which was an independent project that was stopped during the course of the work. This would have had profound impacts on the procurement process as it may have led to greater aggregation of products.

<p><i>Origin</i></p> <p>Sector dominated by Consultants and as such management and administration not seen as the profession Move to professionalisation of nursing – yet lack of investment on behalf of central government in 1980's saw sector decline From early 2000's investment needed – focus on bed capacity and not necessarily services to provide support of beds Again lack of focus due to competition intra-sector – see strategic analysis of sector (Figure 22 for summary overview) Both RMMG and Independent Hospitals developed independent materials management systems – one count gave 32 different systems RMMG – focused on single ERP platform – SAP Investment in technology driven by Financial Control systems and Materials Management Systems -</p>	<p><i>Trajectory</i></p> <p>Clear move to centralisation with establishment of HSE Multiple attempts at improving the procurement process – through investment in external consultants Clear direction at board level prior to HSE to establish central IS control – looking at transaction based systems e.g. shared services and alignment of materials and logistics functions Investment in technology towards standardisation and efficiency</p>
<p><i>Type</i></p> <p>Change in management structures at decade long cycles- last major change was establishment of health boards in 1970's, then in 2005 establishment of HSE. Major changes in procurement resulted from establishment of RMMG in 1996 and next major change was again the move to centralisation with HSE – note scope of this change was continuing after case study was completed Local development of technology prevalent in RMMG's prior to HSE and in independent hospitals. Post HSE – independent development discouraged</p>	<p><i>Momentum</i></p> <p>High premium put on speed of change, but superficial decision making as a result, and momentum not achieved due to hierarchical structures and lack of professional management. Cumbersome and slow decision making process, which has to be ratified at senior levels – Department of Health and Consultants continually at loggerheads thus political considerations interfere with decision making, rendering consensus difficult. Therefore little discernable progress on major issues. PPARs and FISP projects overspend on technology implementation Poor record of technology spend – not encouraging for future spend</p>

Table 12 : Analysis of Sector using Dimensions of Social Change

A second feature that appeared in the analysis was the focus on materials. Materials account for about 30% of the annual spend, the balance is made up of services. The development of the RMMG's and the HeBE, and the new procurement structure of the HSE were focused on materials. Yet the biggest spend was on services. In Case 3, this is discussed, in particular the lack of technology to support service procurement and management.

What became clear in carrying out the sectoral analysis were the constraints being placed on previous independent hospitals and groupings, through the development of centralised systems of first organisational structures and second centralised technology solutions. In the case of the independent hospitals it was remarked that the change in sectoral context meant that budgets would be held if technology solutions were not adopted.

A final note; the analysis revealed that the sector was dominated by consultants. This phrase in the Health Sector generally refers to Doctors. In this study, it was found that management consultants and technology consultants dominated the sector. The drive to change, to adopt technological solutions came from consultants and not from the internal parties themselves.

And therefore it was primarily up to us (The Consultants) coming up with our own set of recommendations which are based on global methodologies that we have.

PKIBCON

5.4 Results Case 1

5.5.1 Case Narrative

This case is the first of two organisational cases. The case is described in a narrative form. Because the organisation is bounded, the case narrative focuses on the organisation and the procurement process is seen in the context of the organisation. The technology and its role are described in the context of the organisation and not of the process. This is a large independent hospital on the North side of Dublin. It is an acute hospital and as such offers the full spectrum of services from Accident and Emergency to specialist care such as cancer treatment. The hospital focuses on delivery of care and although training of nurses and doctors is carried out; this is not the primary aim of the hospital. Access was gained through an introductory letter. This was followed up by an email, which set up an interview schedule with the Head of Purchasing. The

Head of Purchasing offered a number of interviews, but then due to illness, had to step down and the bulk of the interviews took place with the assistant. The unit was a small unit with 7 people directly employed. The total spend of the hospital at the time of the interviews was in excess of €50 million. The main areas of spend were across all elements of the services supplied to the hospital and included for example consumables and services such as insurance and cleaning.

The unit although operating independently reported to the

....non-pay committee which is headed by the chief executive, PABEMM

There was little control over the budget for the organisation; rather the budget was set at the executive level and the unit operated within that.

The actual individual staff budgeting we do not have, but the overall, budget, we operate as an independent service, with an overall budget, so when a request is initiated it is coming out of a total overall budget that is already there...we do have some instances, for example, the number of pace makers we can use is a capped figure and that is agreed with the department, there is other speciality called icds, which is a defib pace maker. It regulates your heart, it is very expensive, we are allowed to do 50 of those a year, that is agreed with the consultants, and we would advise the non-pay committee when we reach 40, there is a link there for very high cost items

ABBEMM

The unit operated its procurement cycle on the basis of an annual budget. They had clear procedures in place for dealing with requests.

We only react to a request (i.e. from a customer, they act as a buyer) we will not react to anything bar a request

ABBEMM

For the purchasing cycle there were clear guidelines for how they could purchase at different values of the entity purchased.

Start with the hospital policy, less than €1000 a quote, €1000-20000 3 plus quotes, €20000+ national tender, €200000+ EU tender those are our guidelines, national tender means we advertise it now we are on the government E-tenders Site. We would advertise in a magazine, in a newspaper, but we are not committed to the site

PABEMM

For the value of €1000 the request is faxed to the supplier; these may be local suppliers. Alternatives have included email and courier letter. For items that were in the range €1000-€20000 – there was no difference in the approach for sending out the request. But there was a requirement for three quotes. If the item could be got locally and it was familiar there was generally not a problem, if it could not be sourced this way the organisation put a tender out.

For any item greater than €20000, a specification needed to be drawn up, this could be functional or technical and approval from non-pay committee would have to be sought. The item would be brought as a request to the non-pay committee and the unit could proceed with the tender. Generally the unit went with open tenders. There is an award criterion included here and it was only at this junction that the interviewees pointed out that this was drawn up in conjunction with the wards and the key user groups. For items greater than €200000, the process was exactly the same as described but it was advertised in the European Journal.

The organisation had only been

...on the e-tenders for the last 3 months, the major thing is that we would have given a 3 week clearance for tender, it regularly happens that we would send out 20; 18 would be a waste. The major problem would be that we would advertise without the specifications, it would give the people time to raise the specifications, a lot of time they (the suppliers) would complain they wouldn't have the specifications, we would have to change the dates

PABEMM

The organisation had been used to sending out requests without full specifications included. Once they went live with e-tenders they found they could not do this.

With this particular system we must have the specification, if anyone comes in, and asks can we advertise, we ask do you have the specification, if no, then we cannot advertise, you give me the specification, PABEMM

There was a move from a more informal to a formal approach within the unit. This move to e-tenders was forced upon the organisation. It had been dictated that all tenders for all public sector bodies must be advertised through e-tenders.

In one case described

... PC refresher program €600-700000, there were 67 people who looked at this tender, if that had been a previous tender we would have sent out 6 – 7 tenders and got 3 replies, they download all the information off the system so its been a huge success in terms of time, ... local agents of Hewlett Packard were all looking at the tender, then they realised that Hewlett Packard would be coming direct, so they did not compete PABEMM

The use of the e-tenders website caused a change not just in the behaviour of the buying organisation but also of the suppliers.

The processes followed were very procedural oriented. Budgets were held centrally and as such no funding for procurement or technology for procurement was present. The unit was purely an administrative unit.

In stock end, consumables, the items that are held in stock are obviously items that are used on a regular basis, common to a lot of areas. There are a lot of consumables that are non stock and these are only ordered to requisition. We have two ticketing systems, we have a bar code system or a requisition system

for non stock and this is done through the wards, and this generates the requisition

ABBEMM

As requisitions came in, the unit dealt with them. At the time of case the unit was under review from the internal audit team

The tender process is being currently reviewed by the internal auditor at the moment, it is a general review and they want to make sure that we are compliant...It is in line with our hospital policy. – It's an audit of the policy

ABBEMM

The unit had little or no control over the hospital policy and although they had written the procurement policy, the audit was being carried out across the procurement process itself.

5.4.2 Case Analysis

The background to this case is that of a large independent Hospital. Its annual spend was large, in excess of €50 million. However the purchasing and materials unit was small. It was an independent Purchasing and Materials Unit in that it had its own budget. The initial analysis for the case is shown in Table 13 (page 172). This is based on an organisational analysis.

It was found that there was little or no drive towards integration with main sector. There was no vision of how it could integrate. What was evident from the day to day to working is that the purchasing status was not recognised. There was a transactional nature to the business. Again there was a pattern of materials management being given priority over services

The technology was old (>8 years). However the system was undergoing review. The system was fully integrated with the Finance system, but there was a directive that any future developments would have to be approved centrally within the Health Sector and that no new developments could be started. The

materials management system was bespoke, and there was no commonality in material codes with any other hospital in the sector.

<p>Structure</p>	<p>Signification</p> <p>Focus in group on cost</p> <p>Procedural driven</p> <p>During case Internal Audit was carrying out audit of procurement procedures and all manuals were being updated</p>	<p>Domination</p> <p>Finance dominant throughout case – even though reporting structures stated that it was to management board, it was through finance.</p>	<p>Legitimation</p> <p>Structured and strategic in conversation</p> <p>Was not seen to be borne out in practice</p> <p>Very operational in practice – legitimation comes from procedures</p>
<p>Modality</p>	<p>Interpretative scheme</p> <p>Hierarchical scheme based on service</p> <p>Unit is a buying unit that co-ordinates its activities with a warehouse and store at the back of the hospital.</p> <p>Work is administrative</p>	<p>Facility</p> <p>Movement within group based on prior work</p>	<p>Norm</p> <p>Procedural oriented</p>
<p>Interaction</p>	<p>Communication</p> <p>Communication is open with services, but warehouse is dealt with as a separate unit.</p> <p>There is informal communication with staff in hospital, but also more formal requisitioning systems</p>	<p>Power</p> <p>HSE – power moved back to central authority</p> <p>There is resentment at this shift in power – systems cannot be upgraded without consultation with HSE</p>	<p>Sanction</p> <p>None that could be seen</p>

Table 13 : Structural Dimensions Case 1

The unit operated a traditional purchasing and transaction based system with no visible materials management / warehousing system in place. There was a use of manual stock systems.

There was a push to use e-tenders, but there was also consortium buying with the Hospital Services Procurement Group (HSPG) carrying out some buying

HSPG do the basic things, like food stationary and a lot of the common items between hospitals, from that then a contract is put in place, each hospital works its own contract, so the amount is on aggregate ABBEMM

Local purchases were controlled directly and there was a great deal of flexibility in the processes. While carrying out one of the interviews, a senior nurse entered the office, and asked for a part. The interviewee took the part from a drawer and gave it back to the nurse. When she left, he explained that the part was a stent.

She always comes in here on a Tuesday. They always seem surprised they do not have these, but I always keep some in the drawer. I know on Tuesdays she is going to come back looking for it. ABBEMM

The proposed framework (Figure 15, page 109) could not be used. Two axes applied to the case, that of the context and that of the type of technology. The process was not clearly delineated, rather there was a lack of clarity about what the extent of the process involved, with pre-tendering work only being done as part of the budgetary process and not seen as part of the process itself, and post award work being seen as part of materials management and not an extension of the process. Because the procurement process was limited and there was little interaction with either outside bodies or other internal functions, an assessment was drawn that little or none of the technologies had a direct impact on the overall process, but rather a single technology could only impact a single step within the process.

5.5 Results Case 2

5.5.1 Case Narrative

This was the second of two cases. The case is described in a narrative form. Because the organisation is bounded, the case narrative focuses on the organisation and the procurement process is seen in the context of the organisation. The technology and its role are described in the context of the organisation and not of the process. This was a small teaching hospital. It was based in Dublin City and is linked to a University. It is a specialist hospital, and although offering a range of services, they are all in one field. The hospital trained students, staff and graduates; it treated patients and carried out research. Access was gained through an introductory letter. This was followed up by an email, which set up an interview schedule with the Supplies Officer. The supplies officer was responsible for the small Purchasing and Materials Unit. The total spend of the hospital at the time of the interviews was €1.83 million per annum. The main areas of spend were in insurance, cleaning, including laundry contracts, external laboratory services, taxis, couriers, medical supplies including laboratory and x-ray, IT and communications, medical instruments, disposables and cleaning materials and supplies.

The supplies officer (TKDDMM) reported to the CEO. There were a total of 3 people who worked directly in the stores. However there was a purchasing committee which reviewed the annual spend.

“Normally it is a representative from each one of the departments, and then we would have the chief of finance, who is actually the secretary of the purchasing committee at the moment and then we would have myself (the Supplies Officer) and then we would have one person who kind of would have anything to do with the suppliers, just to make everything legal..”

TKDDMM

The role of the supplies officer was

“ ... to supply my customers, this is part of the ISO system, recognising who your customers are and I would supply the customers with all the goods they needed from what they need to carry out the days duties and that can be medical gear, medical suppliers, dental supplies and general stationary and stuff they need for teaching, basically I am in the loop, we consider ourselves part of a machine and although only one cog in the machine, take out my cog and the system will stop, like other cogs, take them out and the system stops..”

TKDDMM

The procurement process was described as follows

“There are steps which flow into one another? Everything is done through a written requisition, and each customer has a requisition book, and that number is dedicated to those people...after the requisition is done it comes down here to me, if it is a routine stock item no problem, we just give them right out of stock, then it is entered into the computer for what they want, then we produce a picking list, and for the picking list we produce a delivery docket and the goods are then delivered to the customer. ..then if it comes down as a non stock item, we have two types of non-stock item, non stock items is something we use maybe once a year or very now and again, we have a record of them here and then we would buy them, now in saying that the requisitions have to be signed by the department head, the budget holder...if it is a non stock item, say brand new, there is a form to fill out, ...that one is only going to be used once in a blue moon, two, he may need it in stock, he may want to have it in stock, but three, it is something he wants to use again once in a blue moon, but the form needs to be filled in for that, we have a form ready, pre-printed, each one of the managers has the form on the computer that can be downloaded.”

The process changes for the level of value for the item.

“there is one for €5000 and over, you have to have three quotes, that is easy enough, more than that, you have to have so many quotes... if it goes beyond €30000 you have to go to etender...if it goes above the €200000 it has to go to

OJEC, now the problem arises in the stuff below the €5000, they said I have to have one quote, how low down does that have to go, now no one can answer that question at the moment, do you do it for €4500, do you do it for €2.50.

For the annual tendering the supplies officer gave a brief overview of the process.

“this works, by us setting a date for when we are going to tender that year, then we call the full purchasing committee and I will bring them up a list of what I have in stock .. and they will go through the list, now each group will be interested in its section, surgical/operating theatre will be interested in surgical parts...and they will go through their own lists and they will say we are not going to use this, this year, we are going to use this or vice versa, then again we might say we are happy with everything, then I will come down.. and amend it, and we will draft up a list and the numbers of everything we are going to go with,”

At this point the committee agrees the list and an advertisement is drafted and sent out in the local and national newspapers. In the previous year, to the case being carried out, they used e-tenders.

“we used e-tender last year, about €90,000 worth of business, on paper it looked great and we saved a fair bit of money here and there, but behind the scenes it took an awful lot of time to organise and to do, and then even when we got it up and running and we awarded the contracts to various different people then we ended up with so many returns, there was a huge amount of returns, we had to send back and to myself and some of my staff and some of the other staff it seemed like an age to set it in stone. The most problems, the majority of the problems we had, were with suppliers we had never dealt with before, but they said they do the product and we knew their instruments were very good and that’s why we went for them, only to find out that that’s not what they were quoting for in the first place.

5.5.2 Case Analysis

In examining the case, the procurement process was not seen as a standard to drive the organisation. Rather there was a drive towards integration with main sector and thus a perceived loss of independent purchasing status. This could result in a loss of innovation, as the hospital is a teaching hospital and as such, there is an element of new products being introduced locally that may not arrive if aggregation was introduced. In the time of the case there was a clear sense of loss of perceived service, once aggregation was forced in.

When the technology was examined the current system was found to be old (>8 years), and was integrated with the Finance system. There was a traditional purchasing approach which was transaction based with a basic materials management / warehousing system in place. These included stock cards, and manual requisitions.

The use of e-tenders was promoted. Local purchases were controlled directly, while the larger purchases combined with other independent hospitals through HPSG. The approach to procurement was semi-structured – with the first steps not initiated. There was also a lack of integration of evaluation with initiation. There was little or no contract management evaluation of post contract award.

However due to local purchasing arrangement there was great deal of flexibility built into the supply system.

The proposed framework (Figure 15, page 109) could not be used. Two axes applied to the case, that of the context, and that of the type of technology. Because the procurement process was limited and there was little interaction with outside bodies, little or none of the technologies had a direct impact on the process.

<p>Structure</p>	<p>Signification</p> <p>Procedural focus</p> <p>Based around annual cycles – for EU follow rules, for small value use local suppliers</p> <p>This changed with HSE – focus was on aggregation and so upward move of responsibility – technology driven</p>	<p>Domination</p> <p>Finance dominant throughout case</p> <p>HSE dominant – centralised systems at end of case – strong direction given to procedures</p>	<p>Legitimisation</p> <p>Tactical operations focused</p> <p>Operated with small budget</p>
<p>Modality</p>	<p>Interpretative scheme</p> <p>Simple scheme – supply officer with stores assistants. Unit isolated from main HSE when new structures setup – however Hospital being told to integrate to get benefits from aggregation</p>	<p>Facility</p> <p>Long term appointments – no major changes seen</p>	<p>Norm</p> <p>Good communication at all times</p>
<p>Interaction</p>	<p>Communication</p> <p>Small organisation – communication direct with stores, Supply officer traditional role with direct communication to Finance Director and CEO. There was little reliance on systems to communicate between stores and wards</p> <p>Little or no IT</p>	<p>Power</p> <p>Power limited due to small budget.</p> <p>With the establishment of HSE – there is a perceived move of power back to the centre</p>	<p>Sanction</p> <p>If procurement is not in line with general policy – no sanction seems to be present</p>

Table 14 : Structural Dimensions Case 2

5.6 Results Case 3

5.6.1 Case Narrative

This was a longitudinal case, which ran over 18 months from the first site visit to the last. The group at the time was one of eight regional materials management groups in place. An introductory letter sent to the Regional Materials Manager and a series of briefing meetings were set up prior to starting the case. The case started in May 2004 and finished with the last site visit in December 2005. During this time the HSE was established and the role of the regional materials management group became under review. This case describes in narrative form the procurement process. The structure of the organisation and its interaction with other groups can only be described if the procurement process is central to the results. Unlike the previous two cases the narrative cannot just be focused on the organisation as the process itself spans multiple organisational units. The regional materials management groups (RMMG's) were formed out of the 1996 review of materials management in the Health Sector.

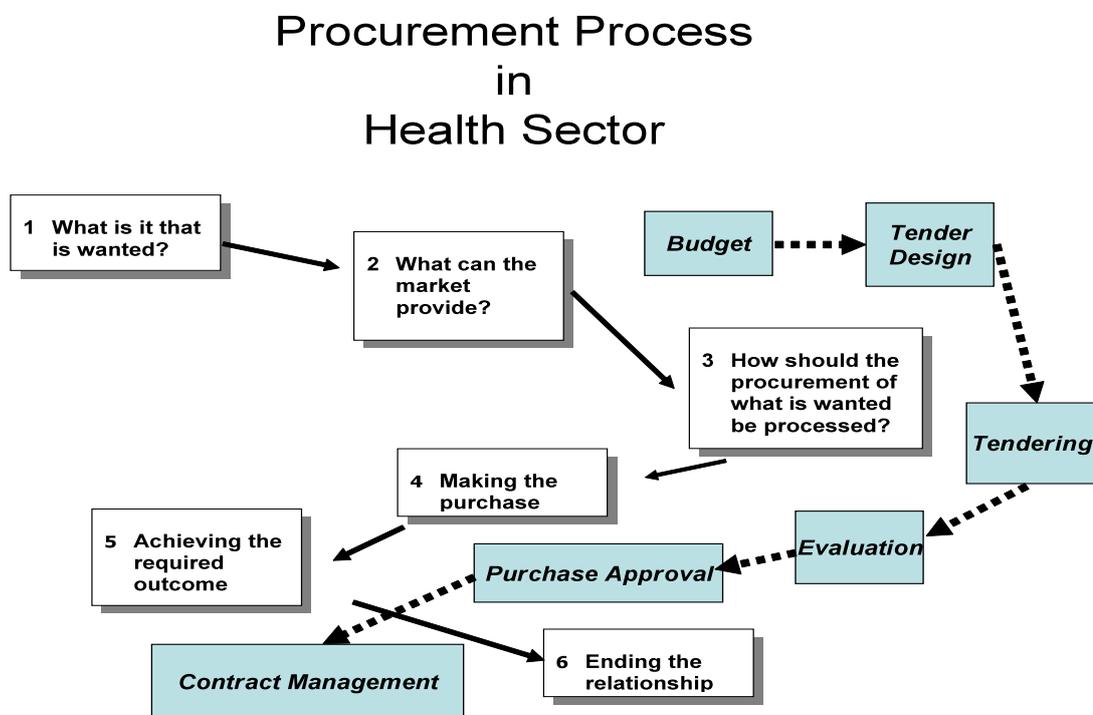


Figure 25 : Contrast of HeBE Procurement Process with Gershon

The Health Board Executive has published their procurement strategy document. This outlined the generic procurement process for the Health Sector, in particular for the RMMG's. This is shown in Figure 25. A comparison of this process with that of the generic one from Gershon, is also shown. There are a number of steps that are indicated within the Gershon process that do not appear in the HeBe model e.g. What is it that is wanted, what can the market provide and ending the relationship.

Figure 26 illustrates the supply networks of the individual Health Boards or rather the Regional Materials Management groups who contract and manage the contracts on behalf of budget holders. The example shown is a simplified map of computer supplies, which was mapped as part of the interview process. The Health Board had established a centralised warehouse where goods were delivered, but community care also purchased directly from local suppliers. The Materials Management group distributed to the local agencies, the example shown is an acute hospital, but they would also have included health centres as well.

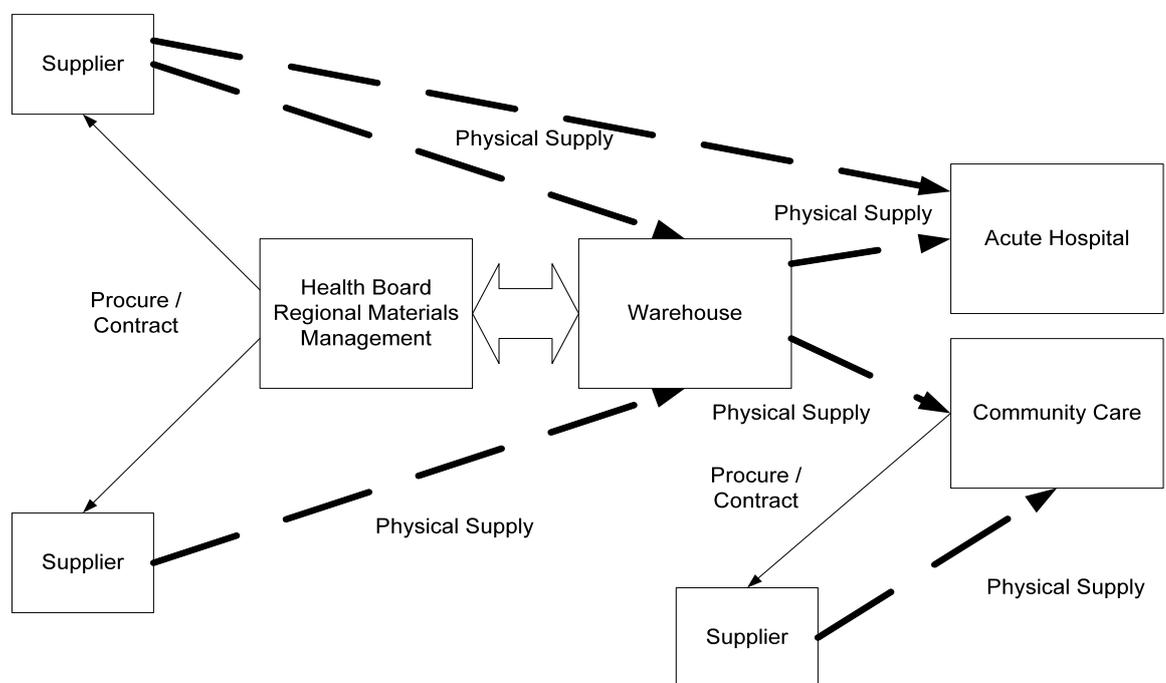


Figure 26 : Health Board / RMMG Procurement / Supply Network

This diagram shows that the RMMG's had two distinct sets of customers; the acute hospitals and the community care. There are clearly defined roles when the process is managed centrally (Figure 27 illustrates the initial procurement process). These roles would include the contract specialist, who would manage the tendering process itself, the user, and the budget holder (this generally is a person who has responsibility for delivery of the service, but may also be a senior manager who has no direct managerial role in the delivery of the service).

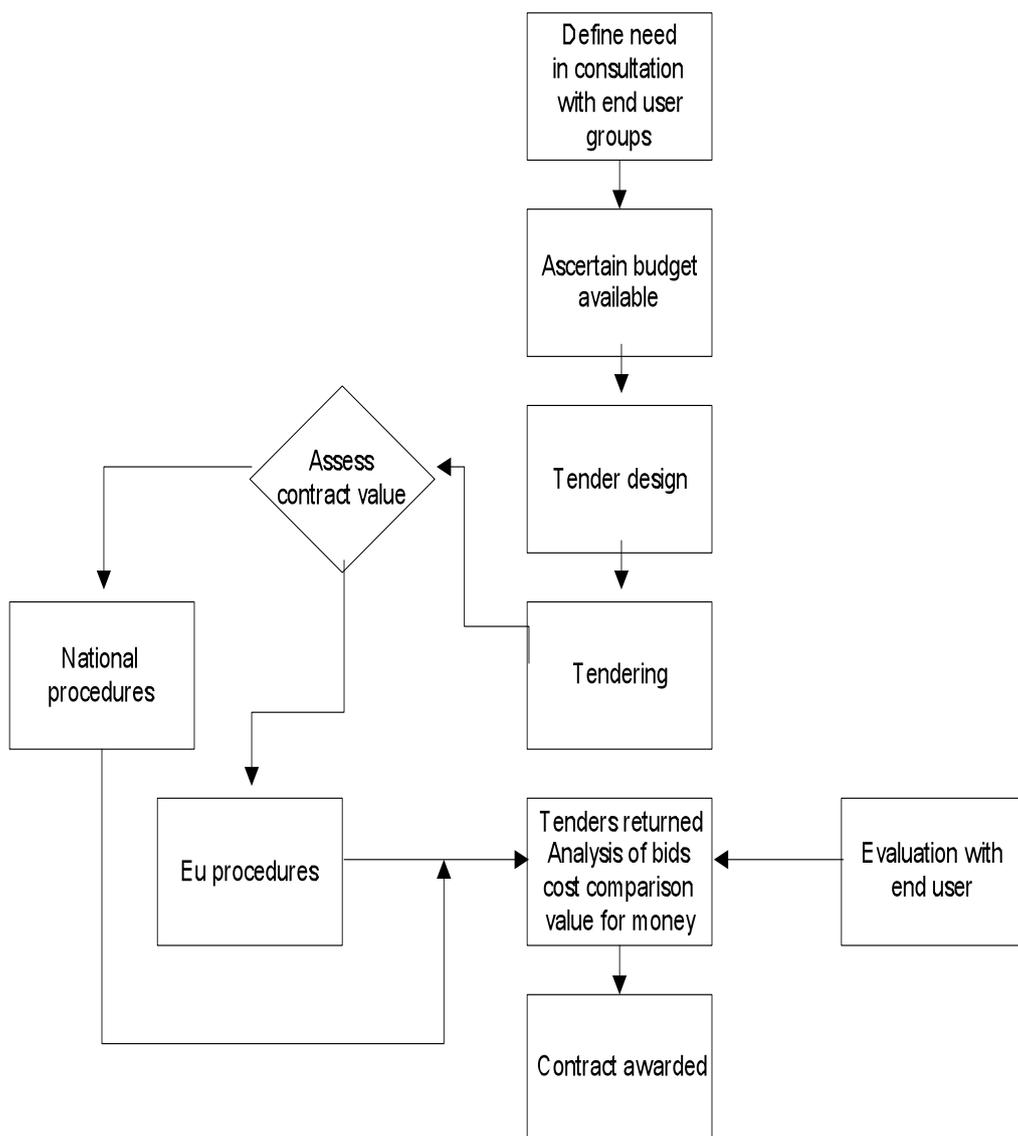


Figure 27 : RMMG Procurement Process

The process for procuring generally starts with the definition of a need. This is usually done in conjunction with end user groups. The end user may be the social worker for instance in the case of patient transport and not the patient themselves, as it is the end user that places the order. In respect of contracts managed through the materials management groups the following statement was made

'...the general managers of the services to nominate users, end users, of the consumables that we were looking for. From those nominations we would form a user group, which would be made up of end users, be they nurses, clinicians, whatever. We would also get representation from the supplies chain, supplies officers. We would sit on that group ourselves as the commercial evaluators.

PMRMMNEHB

In the case of contracts managed outside the materials management groups, there was no formal user group set-up. The social worker for instance may form part of the group of users, but generally the budget holder i.e. the service manager would not.

There are two customers, the budget holder and end users. .. So we find multiple roles... A lot of our end users would have no control over the budget. A lot of our budget holders would not be the appropriate person to choose the correct service. So there has to be something that is pulling it together, so we feel our user group is what is pulling the acceptable products together.

PMRMMNEHB

The need itself is generally governed by a budget which is already in place. New requests for which there is no budget have to go through the Department of Health (at the time of the case). During the case, this budget responsibility was transferred to the Health Services Executive.

Once the budget was ascertained, the process is to draw up the specifications and to design the tender. Where there are contracts that are being renewed

She asked the consultants for the specification because in three years it probably has changed, you know, so she wanted them to rewrite the specification of what we were looking for in new equipment. And what I did for ...was I went back through the old file on the contract and I looked at the last time that we did this tendering process. I was involved in it and we had a huge amount of questions from the marketplace because the specification wasn't clear. So I gave...these are the questions that came up the last time and will you build them into the specification this time so that we will not get as many questions.

PMRMMNEHB

In the case where specifications have to be agreed, there may be iterations of the tender between the user group and the contract specialist. However once agreed the final tender document is prepared and then the tender route is chosen. When going for tender, the contract value is assessed. The value amount of the contract will determine the type of procedure, which has to be pursued. Figure 9 (page 74) illustrates that the route may have to follow EU procedures or National procedures. These national procedures are in essence at sectoral level, although even within sectors there are differences between the threshold amounts for the different procedures. Figure 9 illustrates the typical EU process and the four different options that are available for most contracts have been outlined in Table 4 (page 76). It is worth noting though, that for contracts less than €1500, in the case in question, three quotes would have been sufficient. In an independent hospital which was reviewed as part of the doctoral work, this threshold was set at greater than €5000 but less than €20000. The procedure once the tender is closed, is best illustrated in the words of one of the contract specialists

Once a tender closes it is then in most instances a 3 stage evaluation, of product, supplier and costs, generally what would happen is there is first run look at the supplier and first run look at the cost, because product evaluations generally take a bit of time to organise then there would be a product evaluation from that there would be a second run on supplier and a second run on the costs, so what you come out of here, is that if there was (sic) 10 bidders you would have them ranked 1-10 in each evaluation. So then using some form of

decision support model you are looking at the three different elements and the way in which comparisons are agreed. So for arguments sake you might say, that product is worth 30%, supplier is worth 30% and cost is worth 40%. Well the weighting could favour you. So we agree the award decision with the user group, then forward to budget holder / service manager for approval. Then award the contract

DBRMMNEH

These steps as described above are illustrated in Figure 28 (page185). They take into account identifying a need e.g. what is it that is wanted, examining how should the procurement of what is wanted to be processed and part of making the purchase.

The step delineating what can the market provide, which forms part of the supplier selection phase under Van Weele and Caldwell et al, is not represented here. In the interviews with the key players two diverging views were expressed about this. One view says

So, I do not think we look to see what the market can provide other than maybe doing a restricted process rather than an open process. That might be one way that we would test the marketplace but if testing the marketplace is what is the contract specialist's role in there, I'm not aware of that.

PMRMMNEHB

A second view says

What we would also do for equipment and for other ones is we have a contract with a company called ECRI and they are a non-profit organisation. And what they provide us with is specifications and comparisons. It is a very much an actual web-based thing now. You can always get a huge amount of information.

DBRMMNEHB

Clearly there are different approaches happening within the same organisation using the same standard process. Once the contract is awarded there are a

number of differences that start to emerge between the management of services and the management of products. Figure 28 as one example illustrates the procurement of taxis. Once the contract has been awarded, it is set up on SAP. The contract itself, only lists the main providers, and as such the detail that is recorded is only the supplier's name. There is no order quantity agreed, there is no call off rates, in fact what is seen is that there is little or no information kept on the main system which allows people to access the suppliers other than the financial information e.g. invoices, either current or paid. What happens for the process of requesting a taxi, is that a transport order from a department is raised and a single person is responsible for booking the taxis.

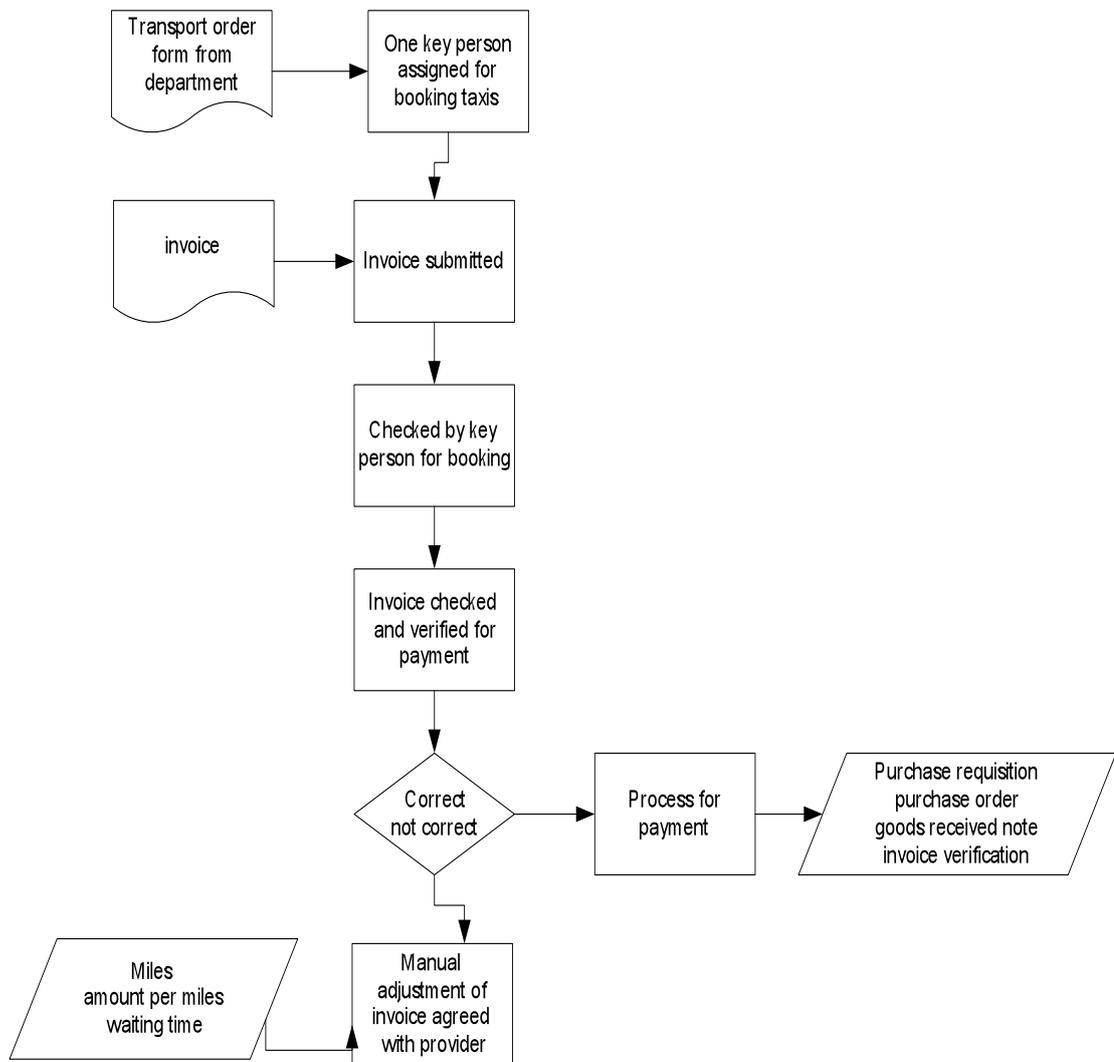


Figure 28 : Procurement Process for Taxis

It is only when the invoice is submitted that it is checked by the key person for the booking and confirmed. At this point payment is raised.

There is however no documentation on the system to show that the taxi was taken, other than a manual receipt from the person who took the taxi. This then has to be matched to invoice which lists for a given period all journeys made. There is a great deal of manual intervention. These steps are the steps involved in managing the contract, evaluating the contract and in some case ending the relationship. They account for the majority of the transactions and work that take place. Figure 28 illustrates this process.

In comparison to the service process of the taxi, the material process is quite complex. There is more interaction and there is more checking at each stage of the process. Figure 29 (page 188) illustrates this process. Requisitions and orders may also be raised through MRP runs.

We use the MRP system. Then we use the barcode reading system on the wall there. And we have an agreed level...we hope to get to a two week (level). We haven't got to that stage yet. We have an agreed level and it is doubled up and when we use the first compartment ... we switch a label which produces a barcode, you go up to scan. It produces a picking list. We take our scan...we turn that box around...this produces a reservation ... from that reservation then we will go get the product and deliver to the location requesting it.

CSNAVCS

This local run feeds back to a central warehouse where the orders are collated and sent to the suppliers. These then deliver to the warehouse where order is checked and the steps outline followed.

What was obvious from the process maps made (Appendix 7 Sample Process Maps) is that although there is a large degree of work carried out in setting up the tenders, this level of work is insignificant in comparison to the maintenance

of the contracts. On a day-to-day basis the contracts and inventory are managed by two separate areas.

From a technological point of view we do hold all our contracts on SAP, when we are evaluating we use obviously again SAP. We have reports devised by either ourselves or consultants over the years. We do also pull information into excel which is quite easy to be fair, if we want to be more manipulating with it. Here for example...where I am setting the MRP levels, I would simply pull off the existing stocks and what that constitutes in forms of days, and I would do a conversion and say if that was running at 28 days this is what they should be carrying, that would be done in excel, and I would simply ask them to re-address their MRP levels.

KKRMMNEHB

We have implemented EBP, we had all our 65 suppliers in the other day and we were explaining how EBP works and how they can access it and tender to us through that. The market – we use the government website to advertise the fact that we have a tender, and there is link to us on that site.

KKRMMNEHB

For product evaluation – we use excel, again the purchase order is always in SAP

PMRMMNEHB

The inventory management aspect of the technology intervention is seen in the development of the Total Inventory Management (TIM) system which was used for the optimisation of inventory between the centralised warehouse and the hospital wards. A transcript of this (this was given by the Inventory Manager) is shown in Appendix 3, along with a transcript of the procurement process in detail as given by the Contracts Manager. Appendix 7 carries additional process maps showing the supporting technologies.

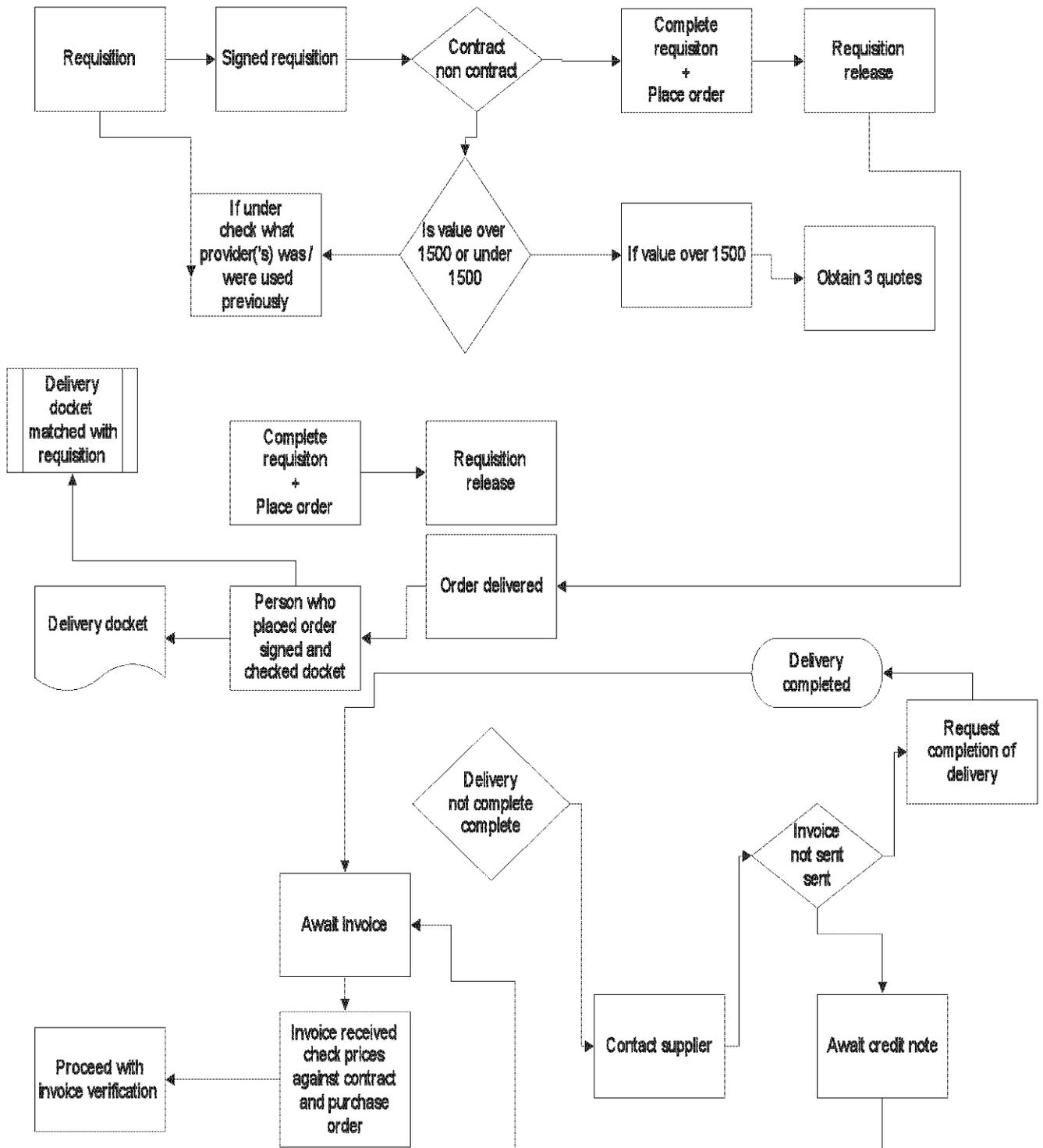


Figure 29 : Procurement Process for Materials

5.6.2 Case Analysis

The Regional Materials Management Group was one of eight groups. It had a large annual spend of greater than €100million. It could have been considered a well-developed unit – having grown from 3 people to over 12 in just under eight years. It was being driven towards full integration with HeBE subsequently this became HSE. The strong hierarchical structures of the HSE took over in January 2005 and over the next 12 months started to increase in control. Table 15 lists out the key pieces of analysis carried out at an organisational level. At the start of the case there was a clear spend portfolio linked to overall sector spend, this would have been based on annualised budgets given to each of the regional health boards.

The role of the group was very clear at the start of the case, it was to

... look after the governance of procurement within the North Eastern Health Board from managing how products and services are purchased to managing stock on shelves like the consumables, supplies contracts things like that, it is not a direct purchasing, we do not do any of the purchasing here, therefore we are in a good position in terms of governance, not a budget holder, not an end user, ideally placed for ensuring good governance in procurement practice

DBRMMNEHB

However towards the end of the case there had been a perception change in the role.

It certainly changed the way people are working because we have assumed new responsibilities. I do not think it would have changed the relationships but it put us under an awful lot of stress.

PMRMMNEHB

The technology was based around SAP. The system was undergoing review with general introduction of FISP and PPARs. But in the region purchasing was found to be fully integrated with Finance system.

Structure	<p>Signification</p> <p>Focus in group on service delivery rather than cost – Process driven</p> <p>This changed with HSE – focus was on aggregation and so upward move of responsibility – technology driven</p>	<p>Domination</p> <p>Finance dominant at start of case- strong direction given to process</p> <p>HSE dominant – centralised systems at end of case – strong direction given to systems</p>	<p>Legitimisation</p> <p>Structured and strategic in conversation</p> <p>Not always borne out in practice</p>
Modality	<p>Interpretative scheme</p> <p>Hierarchical scheme based on service – political promotions</p> <p>Unit isolated from main HSE when new structures setup</p>	<p>Facility</p> <p>Movement within group based on prior work</p> <p>External appointment prior to HSE based on relevant experience</p>	<p>Norm</p> <p>Good communication at times within individual groupings e.g. inventory and stores, or within contracts – not evident between groups – therefore leads to frustration and stress when change happens</p>
Interaction	<p>Communication</p> <p>Lack of communication at times between contracts and inventory</p> <p>Community services not directly involved in procurement</p> <p>Reliance on systems to communicate between centre and units</p> <p>Strong interaction when project based e.g. contracts or TIM</p>	<p>Power</p> <p>Power rested in contracts – from procurement process at start</p> <p>Development of power base began in inventory with links back into the process</p> <p>HSE – power moved back to central</p>	<p>Sanction</p> <p>None present prior to HSE, none evident after HSE</p>

Table 15 : Structural Analysis Case 3

There was a strong material background which was common across the sector, with a well-developed local systems used for warehousing, inventory management, decision support tools, administration and data storage. Appendix 7 lists in diagrammatic form the tools being used and at what point

they were being used in the process. The use of e-tenders was promoted both to publish tenders but also as market information.

The other place we would go for tenders is into the e-tenders website. And the reason for going into the e-tenders website is to see who else is buying this type of equipment, you know. Over the past, say, two years, if you were going out for something like that, a CT scanner, is there a constant drip of people going in for CT scanners or is there just a surge at the moment?

PMRMMNEHB

In examining the procurement process, it was found that there was a use of all steps. Technology had been standardised for parts of the process – but ad hoc use of technology to increase information for decision-making was also used in process.

From a technological point of view we do hold all our contracts on SAP, when we are evaluating we use obviously SAP again...we do also pull information into excel...where I am setting MRP levels, I would simply pull off existing stocks and what that constitutes in forms of days, and I would do a conversion and say if that was running at 28 days this is what they should be carrying, that would be done in excel, I would simply ask them to re-address their MRP levels

KKRMMNEHB

Well the evaluation of costs, there is another system in SAP called business warehouse and that would be connected with, you can physically dump the information out of the EBP system into business warehouse and it churns the figures for you

KKRMMNEHB

Within our SAP system we have a materials catalogue, so what we do, the setup of the contract and I am not sure if inventory management would agree with me on this is based round our operational needs. So if we take incontinence product, which is bundled in together with urinary products group in SAP catalogue, we would look at this group and say right, we are going after these products, we take that group of urinary products. We look at what is in the

market place, and we use that as a starting point...We use excel to regroup these products, using SAP and excel there...The expenditure again is coming directly out of SAP and we pull it into excel so we can identify what % of each product has in the overall spend.

DBRMMNEHB

The technology though is seen as an enabler. As the contracts manager put it

Neither EBP or business information warehouse will give you a definitive answer, nor it should be looked at to give you a definitive answer...So in the DSM element excel is used there,

DBRMMNEHB

The process described to date is complex and spans a number of different organisations. The users, budget holders and providers of the service spanned a number of different hospitals and nursing homes. The processes mapped came out of interviews with the individuals but also with a number of focus groups held in community services. The taxi process was a combination of interviews and focus group data and although a simple service, the complexity of managing this process came through in the number of parties that were actively involved. Unlike the previous two cases, the process could not have been mapped without the other organisations participating, nor could the range of technologies used be clarified.

The proposed model Figure 15, page 109 was used for the initial mapping out of the technologies used in the procurement process. The process as shown in Figures 28 and 29 (pages 185 and 188 respectively), and the accompanying processes shown in Appendix 7 suggested that there was not granularity at the process level. The process had to be described in more detail. The process was mapped out again and it is shown in Table 16 (page 208). This new process was used to replace the generic process in the framework and the map of the technologies redrawn.

Figure 30 (page 194) illustrates the application of the framework for the assessment of impact of technology on a procurement process. The X axis,

which is the context setting axis, shows in blue where there is a direct influence at a particular level (e.g. EU or National), on the procurement process. This influence is assessed on the basis of does it set the type of technology? and where does it say this technology must be implemented? At EU level for example this is clearly seen as a web based system (OJEC) where tenders over a certain value must be advertised. Along the y axis is the process steps. Here the technology types are placed as to where they are acting on the process. What becomes clear from the map is that there a number of technologies in use throughout the process and that to make an assessment of one by itself would miss the interaction of the other technologies that are in place. Figure 30 does not serve to show all the technologies mapped but serves to show some of the key ones found in Case 3.

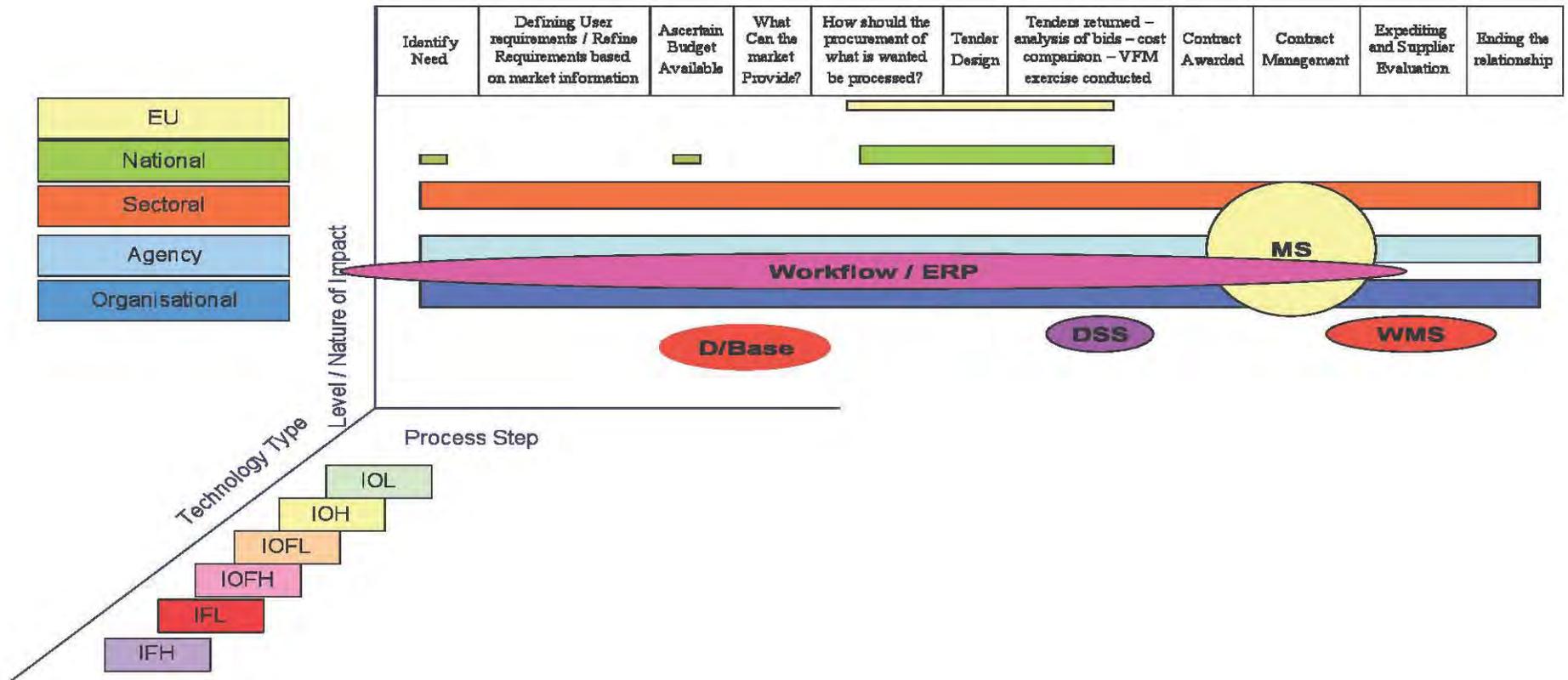


Figure 30 : Framework for the Assessment of Technology Impact on the Procurement Process - Case 3

Chapter 6 Discussion

6.1 Introduction

This research began with a research question. This research question was refined to

How can the role and impact of technology, in the context of the public procurement process, be assessed by addressing the process as a single bounded structural entity?

This chapter sets out the primary discussion based on the themes identified in the literature review. These themes build on the case narratives and the analysis carried out. The chapter is divided into six sections. The discussion of the results are set out using the Figure 14 (page 102), the research agenda to structure the discussion. Section 6.2 deals with the context the cases are set in. It discusses how the development of the sector has influenced the uptake of technology, and has directed the process. This section deals specifically with Theme 6, examining the context in which the procurement process is carried out. Section 6.3 discusses briefly the contrast between public and private sector and the impact that this had on both the data, and the interpretation of the final analysis. Section 6.4 elaborates on the development of supply chain management and how in all cases, the development from a materials management background has heavily influenced the adoption of technology, and the procurement process itself. This section reflects Theme 3, which examines the procurement process in the public sector. It builds on the generic contextual influences that are described in Section 6.2. It also deals with Theme 4, in setting the procurement process firmly in a single state and so creating firm boundaries for the process itself. Section 6.5 examines the technology itself, as presented in each of the cases. This section explores Theme 2, which examines the technology in the context of procurement itself. The last two sections, 6.6 and 6.7 deal with process, structure and structuration. They show

how the cases contrast each other due to the complexity of the process, and the nature of the organisation. Together these sections deal with the remaining themes, examining the changing relationships between IT systems and organisational structure and describing the interaction of technology and people in the context of the procurement process.

6.2 Context

Whittington (1992, p.697) argues that an organisation's structural properties are drawn from the social systems in which members participate. In Chapter 2, it was highlighted that this was relevant to the work, given that all organisations working in the public sector are operating under different contexts to that of the private sector. Ferlie (1992), Boyett et al. (1991), Bryntse (1996) and Van Weele (2004) have all argued that the public sector is more highly regulated and politically constrained than the private sector. This difference is elaborated on in Section 6.3 in more detail. For now it is sufficient to acknowledge that this is one factor in setting context.

The second factor that sets context for all the cases was the background to development of technology in the public sector, in particular the development of the role of technology in the Irish Public Sector. Objectives one to three of the thesis were to explore, review and assess the Irish Public Sector procurement process and in particular to examine the developments of the procurement process since 1990. The key developments have been examined and were outlined in section 5.1. It was found that with the introduction of the Strategic Management Initiative and the Management Information Frameworks in the mid 1990's, the context was set for the development of financial management systems. These systems in turn were seen as the integrators of payment systems and as such material control systems. Stock systems and stock management thus were integrated. This led to the development of procurement as a reporting structure within the finance section of most public sector bodies. These systems where adopted also tended to based on ERP models and as

such were material focused with little or no support to the management of services.

The second major context setting for the Irish Public Sector was the publication of the e-procurement strategy. This formed the background for technology adoption across all sectors in the area of procurement

And one of the things in there was E-procurement so each government had to tick a box that they had done something about this. And so that generated a project within the Department of Finance which embraced a lot of other departments as well actually, representatives of all the sectors... we actually emphasised the non-E piece of it, the need to look at procurement separate from E-procurement. And that's actually how it transpired. That is what ultimately happened! When we talk later about the strategy, you know, there is much more in the strategy about procurement than there is about EP.

PKIBCON

The technology adoption that occurred after the publication was seen as a result of the government pushing the technology agenda, rather than the organisations adopting it. The Irish Health Sector focused in on the delivery of the procurement process and the strategy for better procurement with technology being seen as an enabler.

This section showed that the analysis established the context for change in the public sector and examined the drivers of technology introduction. In creating the model for analysis, it had been seen that a major gap in the literature was the lack of context setting for the adoption of technology. It was critical that this research established that context was required to understand the impact that technology had. The next section develops the discussion of public sector and in particular discusses the development of the organisational form as present in the Irish Health Sector.

6.3 Development of Public Sector Structure

It was clear from the literature (Zenz 1994, Van Weele 2004) that there are differences between the private sector and public sector. It is clear the organisational forms in the public sector are more complex, but the role that structure and organisational design plays in emphasising the changing importance of a function is also clear.

Work had been carried out in the area of supply networks in the private sector (Harland 1996, Lamming 1996). This work built on the context of operations strategy. During the current research, the Health Sector underwent major structural change. At an organisational level, Case 3 moved from a decentralised system of supply to a centralised system of supply. This did not in anyway affect the nature of the process or the interactions across organisations. It changed the physical supply side but did not affect the service supply side or the process of procurement itself. The initial work showed that the networks appeared similar in nature across the Irish Health Sector, but that there was diverse management structures present, and the reporting relationships e.g. in some instances procurement reports directly to finance, in others it reports to the CEO of the board, supports the conclusion by Harland (1996, p.191) that “these infrastructural changes may make the existing network more efficient, but unless a strategic and structural review is carried out, they may represent expensive and inappropriate investment decisions.”

Quite clearly there was a lack of literature on the public sector procurement process. This thesis contributes significantly to the literature by recounting the complexity of the procurement process within the public sector, but also by highlighting that procurement is not about following the tender rules but is a more iterative process that has quite a large degree of flexibility built in. The work by Zenz (1994) and Bovis (1996) in describing differences between public and private sector was critical in being able to define the process as bounded. The procurement process was found to be institutional. Heintze and Bretschneider’s (2000) work on structure and restructuring became relevant in observing the drivers behind the structuring of the Health Service Executive,

which came into existence part way through Case 3 (this built on objectives 2 and 3 of the research). With the implementation of SAP and the driver of the Management Information Framework, there was a drive to centralisation of structure. This contradicted the findings of Heintze and Bretschneider, in that the adoption of both the frameworks and the ERP system was seen in all three cases as a drive toward centralisation. This adoption of SAP as a single system and the rollout of the projects including the Materials Master project were of a national scale, and involved a large number of agencies across the Health Sector. At one meeting, there were over 10 different agencies represented and a consensus view could not be obtained of what steps were to be followed. In all three cases, restructuring was felt to be inevitable however making these new structures work was always questionable.

The changes seen throughout the research in environment and managerial practice have been debated to date as part of the centralisation and decentralisation of procurement within the public sector, yet they were clearly evident in the changes being made by the Irish Health Sector. The findings from this research from each of the three cases and the move to standardisation being felt in Case 3, make a direct contribution to the debate on centralisation vs. decentralisation in the public sector, and more importantly to the debate on centralised versus decentralised procurement. In both organisational cases, there was a great deal of control but also of flexibility in managing the procurement process, whereas in the process case, there was a considerable complexity involved. Case 3 illustrated that the centralisation of procurement brought with it complexity that required a large degree of coordination. Whereas the first two cases, illustrated that devolution of responsibility to individual organisations gave flexibility in delivery.

This section discussed the moves to centralisation of the Irish Health Sector, which occurred during the research. This was a major period of change and the research contributes by capturing empirical data of the effect of the proposed moves. Core to the research was the question of impact of structure and in particular did this structural move act as a driver for technology introduction. What is clearly evidenced from all three cases is that technology in particular

standardised systems would be put in place once the HSE was firmly established and that autonomy would be removed from the independent hospitals in choice of technology implementation. The next section builds on these developments by discussing the parallel development of supply chain management. It will be shown that this development also influenced the choice of technology because of the materials background the organisations and actors emerged from.

6.4 Supply Chain development

In the literature, there has been evidenced a growth of interest in supply chain management from the early 1990's. From the context analysis, it was clearly seen that the Irish Health Sector saw this as an area for growth. In 1996, the formation of the Materials Management Groups reflected the growing trend seen in private sector to focus on the supply chain. What is interesting to note here is that this growth was directed towards materials management that mirrored one element of Tans (2001) model of Integrated Logistics and Supply Chain Management. The objectives that were focused upon were visibility of product, consolidation of distribution, replacing inventory with information along with a process orientation. Some 7 years later in the sector, the setting up of the Health Board Executive (2002) and the development of the Health Procurement Strategy (2003), showed a remarkable similarity to the second stream of Tans model, which focused on purchasing and supply. In particular the direction that was evidenced from Case 3 is more towards the second stream of supply research, than the traditional view taken in both Case 1 and Case 2. The development of two streams of supply chain management is reflected in the development of roles within the materials management groups, although there is still confusion over the boundary between purchasing and inventory management.

'Look, we need to be talking to each other. You know, you cannot be over here doing your contracts and I cannot be over here doing my inventory and hope

that, you know, we are OK with each other”

BKRMMNEHB

As the procurement function has developed it has overlapped with supply chain management. Van Weele's (2004) definition of procurement as encompassing all activities differed to the findings of each case. Both Case 1 and 2 illustrated that traditional purchasing was still the mainstay of the activities. In Case 2, describing primarily a store based organisation, there was little development in the area of procurement of services. There was a development of a new IT system for the organisation, but the role of procurement here was purely to say what was needed in terms of a stores management system. In Case 1, the organisation although co-ordinating with the warehouse, separated the materials management function from the purchasing function. In Case 3 although there was a clear written delineation of roles between both contracts management and inventory management, yet there was in practice confusion over the boundary between the two areas.

The background to the development of supply in many sectors has been traditionally one of materials. This section showed briefly that the public sector and in particular the Irish Health Sector developed in much the same format as many private sector organisations. The development of technology, in particular information technology, has been to support the many manufacturing organisations and the materials management focus has remained in the sector even post the establishment of the HSE. This again firmly sets one of the key drivers for technology adoption in the sector. In the next section, the discussion turns to the technology and discusses the impact of technology, so focusing on research objective number four.

6.5 Technology

Davenport's (1994) identification of the information facts of life in many ways mirrored the informal way that both independent hospitals in Case 1 and Case 2 used technology. Most of the information they handled they preferred to get

from people. There were elements of variability and disorder to the way the information was handled. Given the dictate of the HSE, at the time to implement SAP across the sector, Davenport's note that "the willingness of individuals to use a specified information format is directly proportional to how much they have participated in defining it" is true in each of the hospitals. They clearly resented the imposition of the HSE or any outside body and had developed independent systems in both hospitals.

In both cases the toolsets developed were standalone, either stock control systems or simple ordering systems, which were, linked to the financial control systems of the organisation. In Case 3, it was clear that the main stock system was based on SAP and had been pushed through from a finance perspective. There were other systems in place, including the total inventory management system, as well as the central repository of files that had been built up. Brady's ('03) description of researching technology in clusters is pertinent here, as Case 3 used the mix of technologies together, whereas there are clear distinctions between where technology was used in Case 1 and 2. With a complex process, spanning multi-organisations, it was clear that technology could only be examined as a cluster. Although there was an Enterprise Resource Management system in place, it was how other technologies, identified by Brenner and Hamm as inter and intra – organisational, were used that distinguished Case 3 from the other cases.

Common in all cases was the procedural focus

There are steps which flow into one another Case 1

It is the same process...it is in line with hospital policy Case 2

We would see ourselves as service providers, we do not have any direct supervisory role, and we are advisory. Our advice, for example my advice on stocking at the year end, I have a set of procedures for those now. Case 3

There was however a clear commitment evidenced in Case 3, which neither of the other two cases elaborated to use the technology to make information more explicit and to move away from the tacit knowledge that had been present.

When I came here first everything was filed, and everything was emailed, printed and copied, everyone had their space on their personal computer. One of the first things I got done was to get a shared drive, so that all our files were kept relating to contracts, projects in the same area, so that if someone was off on holidays or whatever and you needed, there was a query or you needed to get some documents, you went into a shared drive, you were not praying to god that someone had managed to file it all in a paper file and that there, even though, its great, everybody has desktop computers now, but still the idea of having a server and a central storage makes a difference to how you manage your business, well for us it does.

Case 3

Earl (1989) had established that there were different periods of technology, as had Nolan (1979) and Zuboff (1988). The process of procurement as has been recorded in all three cases was consistent, yet the stage of technology adaptation was different. Certainly in both Case 1 and Case 2, the technology was at an early stage and both organisations could be said to be focused on data processing and as such using the technology to improve efficiency by means of simple automation. In Case 3, this organisation was focused not just on improving efficiency but also on improving the information management flows, a characteristic under Wards (1990) model of the MIS era. This also ties in with Zuboffs (1988) framework with Case 1 and Case 2 being purely at the automate stage and Case 3 being at the informate stage. In all three cases it was not felt in examining them that they were at the later stages of transforming their procurement processes, let alone their organisations through the use of technology.

In Chapter 2, Section 2.5, a background to the development of information technology was explored. Its worth noting that when examining the complex systems in each of the cases that things have not changed much since the first codifiable sets of data were used— the use of stock cards, the use of simple

scanning, order books, manual reconciliations, the use of telephone fax – for example there was a case of the fax being used to centralise the procurement tenders in the HSE observed during the site visits in Case 3. All of these sets of data required in many cases manual interventions, the data may have moved from being transferred on punch cards to being input through standalone terminals and where networking was available, the use of PC's was noted. It is significant that where PC's were used in stores and in many of the ancillary locations in all three cases, they were being used mainly as data entry or data searching tools. Other software for development purposes or even simple communication purposes such as groupware or email clients was not in evidence.

A great deal of investment had been made in the general public sector for the development of e-systems. Yet even for simple systems the costs were still high. In Case 2 it was noted that there would be need to be a full EU tender raised for the new system (putting the initial value at >€200,000); in Case 1 it was remarked that any new system investment would have to require approval from the HSE (putting the initial value at >€50,000); in Case 3 SAP was being rolled out across the sector. As of January 2006, the estimate for one module of SAP associated with Personnel and Payroll was in excess of €230 million.

In Section 2.5 it was noted that remote access links using telecommunication links could enable data being entered and accessed from geographically dispersed regions. It was also noted that many of the systems operated in real time. In all Cases, there were discrepancies in data across sites, between physical and system. All cases did not show proof that the ICTs across organisational boundaries realise the benefits that were espoused, nor did the process improvements happen in the way that it was envisaged. In all three Cases it was found that when checking systems, either the physical location (i.e. where the stock was held or had been delivered to) was called or the supplier was called to validate the data. There was a complete lack of trust in the systems. In Case 3, however there was concerted effort to improve this, the development of the total inventory management system was a good example. This system is recounted in Appendix 3. This system gave a clear view of how

ICT could function across organisational boundaries where a process view was adopted.

The ability to process large amounts of data was a characteristic described for most large scale systems, yet in all Cases there was a large use of Excel and not the main systems for data management. Case 3 again showed with the development and use of business objects, that technology could be used to support management information and as such management decisions. However the higher-level information was clearly not in use. Even Case 3 was still really operating at tactical level. An example was the managerial accounts published for the Case in question they did not deal with the outputs but rather the cost of the inputs. The accounts were based primarily on summary costs with little or no breakdown in costs available. At the Materials Master meeting attended, it was noted by one region that access to management information was limited due to the complete use of 'bucket codes'. Bucket codes were defined as 'drop all' codes where everything that was ordered and booked into the system was put into a single code, so no management analysis could take place. These were common codes in all three Cases, although Case 3 had a limited number of them.

There were clearly different patterns of use between the three cases of technology from the basic stores in Cases 1 and 2, to the development of e-tendering and decision support systems in Case 3. These developments varied over time, with Case 3 being the most proactive in seeking out new technologies and examining places to apply them in supporting the process. What became clear over the longitudinal study was that technology was only applied at the appropriate place. Barras noted the changing patterns of usage of IT and it was clear from the studies that in Case 3 there was an attempt to develop new services. Case 1 and 2 were clearly examining the process of automation (i.e. automating existing processes) but had not yet thought about developing additional services.

The adoption of SAP across the sector as Kallinikos (2004) put it, moved the organisational wide systems a step further in shaping human agency in the

Health Sector. The organisation of the process as a series of standard steps though threatened the flexibility of the process. As the adoption of the large scale system was threatened with rollout and implementation it was seen as the catalyst for centralised control. It is clear that the impact of technology as observed in all three cases at an organisation, agency and sector was the centralisation of control and standardisation. Yet the impact of technology at the process level was much more associated with improved efficiency and improved flexibility in delivery of service. Control was not a feature.

This section has discussed the impact of technology. In particular the key contributions made here were the differences between the three cases. Those researched in Case 1 and Case 2 at an organisational level saw no need to improve process. The technologies in place fell into the low degree of unstructured activities and were mainly Interfunctional. There was some scope for technology at the high structured end and in an inter-organisational context but this was mainly by email and simplistic technologies like the fax. Those in Case 3 however adopted new technologies and spanned the range of technologies outlined in Brenner and Hamm's (1996) model. It is clear from the discussion though that even for Case 3 there was a forced move to standardised systems that were inter-organisational. There was some innovation at this level with the introduction of EBP and the TIM projects. The next section discusses the theme of process, building on the technology impacts discussed here.

6.6 Process

The procurement function should not be seen as simply one of processing paper but rather as the creator and manager of supply relationships. This means that the structures adopted should place procurement at a strategic level rather than just the traditional operational level. There is evidence to suggest that current moves in the Health Sector show procurement as purely transactional and that full value is not being realised through the restructuring process. In the three cases it was clear that purchasing in the traditional sense of the word was very transactional.

The main process maps were built initially using the work of Winograd and Flores (1987), by examining the speech acts that were used. It became clear however that there was a lack of knowledge within organisations of the concept of process other than that of managing information and material flows. All three cases although recognising there was a customer, generally associated the customer with the user, yet most of the work to date in process (for example Johnson and McCormack 2001) emphasised the customer as being the main focus of a process. The maps were brought back to each of the cases and traditional maps were agreed, using simple charts to illustrate the material and information flows. The strength of focusing on the communicative aspect of the process was clear however without the inherent dissociation of material flows. This was the main reason for the process maps as envisaged initially not working.

Lind and Goldkuhl's (2001) view, that processes could not be regarded as sequentially related processes, agreed with Bryntse's (1996) view that purchasing could be seen as a circular interactive process. In Case 1 and Case 2, what is clear is that this interaction is limited. There is some iteration at the early stages of the process, but there is disjointedness at the end of the process. It is only when examining Case 3 where the process spans multi-organisations, that this interaction takes place. This was evidenced in the multi-layered process that takes place for the procurement of services and materials in the community services section of Case 3. The process is not linear, nor is it a simple six-stage process. In representing the process in tabular form, the comparison can be drawn between the processes of Novak and Simco (1991), Archer and Yuan (2000) Van Weele (2004) and Gershon (1999), the latter model was a starting point for this research. Table 16, page 208 illustrates one of the key findings that of the iterative nature of the process as seen in the cases and that the process is more complex than those described by other authors. This is shown where the arrows indicate that process can move from 'what can the market provide?' to identifying the need repetitively. The addition of the work of Caldwell et al. (2007) is timely, as this recent review of the procurement process acknowledges the complexity of the process but still tries

to simplify it down to a series of top-level steps. This addition shows clearly the contribution made by the research to the description of the public procurement process.

Each of the steps found here is dependant upon the next step and the iterative nature of the process is different to the standardised process that is normally represented as public sector procurement (see Figure 8, page 67).

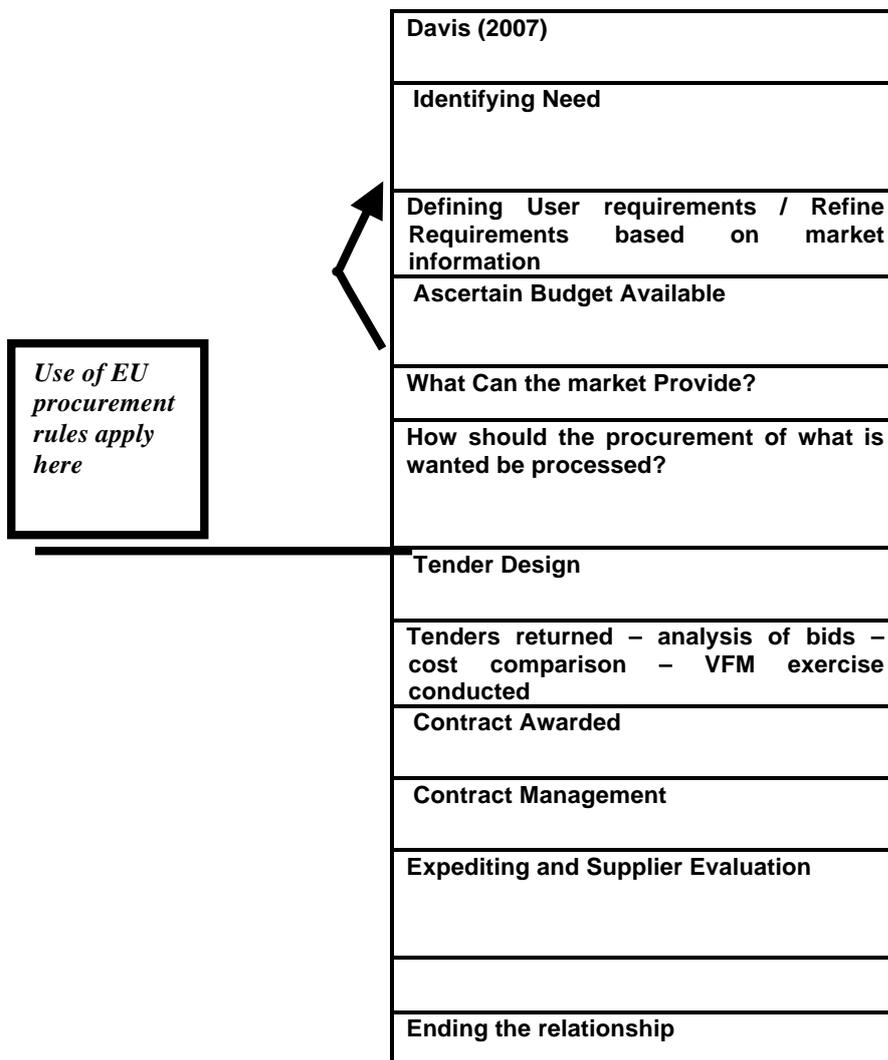


Table 16 : Model of Procurement

Gershon’s (1999) model, which was used as a basis for mapping procurement, showed up a number of issues across all three cases. Gaps in the interaction of the supply and inventory are not catered for in any of the cases, although in

Case 3, there was a clear view that some overlap between the inventory and supply side should take place.

In Case 3, the two managers, the inventory manager and the contracts manager shared an office. When the inventory manager was seconded onto another project, the lack of knowledge by the contracts manager of the inventory role became evident.

*That was Ok. But then when **** left and **** moved into his role and **** moved into ***** role so I now found myself learning a new role, going to ****eter for support. *****r's actually trying to learn **** role and, you know, is under severe pressure to provide support to me and learn his own role. And I go to ***** maybe for that little bit of extra support but ***** was trying to learn...***** role. And at the same time I am trying to teach somebody else what my role was. There has been a lot of tension but not argumentative tension.*

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Prasad (1999, p.178) described, “a process as a set of 7Ts (Talent, tasks, teams, techniques, technology, time, tools) arranged in a particular manner so as to transform a set of inputs into a specified set of outputs (goods or services).” In all Cases, it was evident that the procurement process involved talent, tasks, teams, techniques, time and tools.

What became obvious were the differences in the way technology was used. Case 1 and Case 2 used technology in a very basic way. Both organisations had stock control systems and ordering systems related back to finance. The use of a total inventory management system in Case 3, though substantially changed the way that ordering took place, changed the relationships that were maintained with suppliers and eventually made changes to the contracts management. A second piece of technology implemented was the EBP.

... we have implemented EBP, we had all our 65 suppliers in the other day and we were explaining how EBP works and how they can access it and tender to

us through that... we use the government website to advertise the fact that we have and there is a link to us on that site

Case 3

This substantially changed from the process being manual to where the process was fully automated.

Checkland (in Childe, Smart and Weaver, 1996, p.3) noted that processes could be represented as human activity systems, which are linked together so that the whole constitutes a purposeful activity. Case 3 in describing the organisation, outlines the activities that take place and as such is giving a definitive description of the procurement process as a set of linked activities.

...then there are two departments, inventory management and systems development and the contracts department, the inventory management and systems development would look after the implementation of stock systems for managing stock and they also look after, they take responsibility for managing the materials catalogue on SAP. The contracts department looks after putting in place renewable supplies consumable contracts for both medical and non-medical products and for equipments and services...

This section has dealt with the implementation of the technology and in particular the role of process. The next section deals with the application of structuration to the impact of technology on the process itself.

6.7 Structure and Structuration

A number of different alternatives to procurement organisational forms were presented and in particular the multi-unit organisation could be assessed as being most similar to the HSE structure found. There seems to be a move to the hybrid / line structure happening with an increased use of pooling to take advantage of the scale of purchases that are being carried out in the sector. However at the time of the analysis there seemed to be a strong indication that the HSE would like to centralise the transaction processing. This was

traditionally carried out in the procurement and so a shared services was proposed.

In the Health Boards there was a move towards a more centralised role for procurement. While in the hospitals which mimic the single unit organisations there was a clear centralisation of the function although the reporting structures vary.

Both Johnson (1999) and Brenner and Hamm (1996) noted that business strategy influenced structure. It was also noted that in the literature (Johnson et al, 1998) procurement was and has moved to be a more strategic function in the private sector. This has meant that procurement structures have been influenced by the business strategy but have also been recognised as being of strategic importance to most organisations. In the Health Sector in Ireland, procurement has been removed from the strategic position to one of operational and transactional. This is reflected in the structures being adopted. Other factors are also at play here. The role of procurement has shifted in the private sector as the importance of long-term relationships and supplier management has become evident. As Van Weele (2004) noted earlier, partnership relationships are not fostered. This means that the structures in place reflect both the strategy of the HSE and complexity of managing for accountability and transparency in the public sector.

Giddens (1979, p.69) view of structure is of a structure that has no virtual existence. Whittington (1992) goes further and explains that structure has no reality except as it played out through activity by the participants (the actors). In Case 1 and Case 2, the organisations quite clearly have structure as recognised by the activities they are responsible for. The structures of these two cases are defined by the rules that are placed upon them by the agency in which they operate. In Case 1 this is an independent hospital, in Case 2 it is a teaching hospital. Both Cases have purchasing functions, which have the right to resources through the activities they carry out.

In Case 3, the regional material management group could have been chosen as an organisation to examine the impact of technology, but the process of procurement itself spanned multiple organisations. When examining the process it was found to have routines, which were recursive. The practices of tendering and the associated steps, for example, in forming user groups were capable of being replicated over time. Whittington argued that rules, conduct and allocation of resources are drawn from social systems in which the members participate. Case 3 clearly established routines and resources were not allocated on the basis of organisational structure, but on the basis of process requirements (e.g. user groups, evaluation, tender decision, contract management).

Whittington also remarked that context was critical for observing how social systems worked. In all cases it was clearly shown that context could be examined at different levels, from European Union to organisational. This detail has formed the basis for the analysis.

Orlikowski (2000) remarked that technologies could neither be stabilised nor do technologies have structures embedded in them. In looking at the Cases, it was clear that the processes were developed from routines and as such technology was seen to be more adaptive when examined at a process level than when examined at an organisational level. Secondly, Case 3 clearly demonstrated that new structures e.g. processes, emerged when the total inventory management system was put in place. The recurrent use of technology led to these new structures being formed. Technology was seen as both an enablement and a constraint. If analysed organisationally however process overcomes this and therefore technology is seen as an enabler. This is arguably how it should have always been perceived. This meant that the view of processes is closer to Giddens than Orlikowski, because processes are not necessarily concrete but are the development of routines, which become reasonably stable over time. Routines were defined as the taken for granted character of the vast bulk of activities. Hence in examining process, it was found that one was examining structures that were embedded in the practices of the actors.

There is an overlap between the analysis at a social level and the analysis carried out here in looking at the process. The context of history, as has been seen in all of the cases, has been influential in both the role of technology and how it has been adopted. Although the technology was evident in both Case 1 and Case 2, it was not until the process was examined did it become clear how the role of technology had developed. This has been discussed in Section 5.5.

Even as it is recognised that technologies are designed and used recursively it also needs to be acknowledged that the differences between technologies determines the degree to which users can affect design. In this case it was clear that those in Case 1 and Case 2 did not see any role in technology development. Because of the cross organisational nature of the process in Case 3 it was clear that the design could be affected by the users. Two areas showed up, the first was the active role of participants of the process in Case 3 in the National Materials Master and the second was the development of the total inventory management system. In both cases where users were involved there were clear signs that adoption of the technology and the opportunity to embed the technology as part of the process, were present.

Giddens (1982) spoke of consciously and unconsciously motivated purpose in respect of reasoning behaviour. This was evident in particular in Case 3, where adoption of new practices was governed by the motivated purposes of the actors.

In examining the three cases and in using structuration theory, it became clear that the impact of technology could be better understood in examining the process rather than the organisation. Rose and Hackney (2002) drew out the structures for analysis and these were illustrated in Figures 12 and 13 (pages 92 and 93 respectively). In the detailed analysis carried out, social structure, as constrained by organisational form (Case 1 and Case 2), was inhibited by the agency the purchasing organisation was part of. In Case 3, this was found not to be the case. Social Structure was rather inhibited by the complexity of the product or service being procured, but the groupings of actors and so routines

varied only by either of these two variables. If in Case 3, the organisation of the RMMG had just been examined and the roles of the acute hospitals, the nursing homes and community care had not been looked at, the procurement process would have been perceived to be quite limited. With the inclusion of the organisations mentioned and the process taking the place of the organisation, the interaction of technology with humans could be clearly seen. Schwarz (2002) states that the use of IT has been recognised as being influenced by the users understanding of the properties and functionalities of a technology, but it was only through the examination of the procurement process across organisational boundaries, that it became clear that multiple perspectives could be taken on the same technology.

This section examined the cases, discussing the use of structuration theory to help understand the impact of technology on the process. It summarised the main contributions in the areas of the research under themes 4 and 5.

6.8 Impact of Technology Framework

Process and organisation have been discussed in the previous sections. The framework put forward and used in assessing the impact of technology has not been discussed. This section sets out to discuss how it has been used and how it draws together the strands of the thesis.

The framework adapts three axes. The first is built from process theory and procurement. In this axis the framework quite clearly maps out the process of public procurement.

The second set of data and so the second axis of the framework, is that of context. This was discussed in terms of Whittingtons observations on Giddens work, that structures are context specific. This axis is derived from the public sector and is specific to the public sector.

The third set of data builds on Brenner and Hamms model of forms of technology used in procurement. The matrix was adopted and generalised and

the main categories of technology groupings adopted. Again this can be changed to suit the process, organisation and context that are examined.

The model has been adopted and tested in the three situations. It can be used at an organisational level if only examining one technology (as has been done in this research). This research set out clearly that technology needed to be examined in clusters, as that is how managers use it (Brady, 2003). Quite clearly the model is best suited to examine processes where there are groupings of technology as in Case 3.

6.9 Contributions

In this section the key contributions are described. This research has highlighted a number of themes and gaps in the understanding of the impact of technology on the procurement process. In the following paragraphs the contributions are described with each showing clearly how it has advanced theory in the field where relevant.

The first contribution is the recognition that the appropriate use of technology within a process had a greater impact than applying technology across the whole process. The second contribution found that it is critical to examine the context that the technology is applied in, and to assess the influence of that context. With the development in technology over the past few years and in particular with the rise of enterprise resource planning (Holland et al, '99), focus has shifted in research from looking at what efficiency and effectiveness gains have been made through the implementation of technology to the impact of technology itself on the organisation. The changing relationship between IT systems and organisational structure is therefore the first of the key themes, which this research addresses. The research focused on the technology as a cluster, not an individual piece of technology and as such highlighted that the appropriate application of technology was more important than the broad-brush approach. In particular, the research showed that to assess the appropriateness

of technology, it was critical to look at the context that the technology was being applied in. In traditional research approaches the organisation has been the context for analysing the impact of technology. The research clearly demonstrated that the application of technology to process was not bounded by organisation but rather by the process itself.

Brenner and Hamm (1996) identified a clear need for information technology for purchasing. They went further in identifying that the current technologies are based on a Tayloristic viewpoint of processing data and functional working. However, as the development of procurement moves to operate in a process environment, where there is a preponderance of unstructured activities or more so in a value chain context where there is a high dependency on other external links outside of the organisation, new ways of looking at technology becomes critical. This second theme for the research; to find a way of looking at technology in the context of procurement, contributes both to the theory of procurement but also to the theory of technology assessment.

The third contribution found new and unique empirical data on the public sector process in Ireland, e.g. new data on centralised structures and new data on processes not presented before. The third theme of the research was to focus on public sector in the research. This is due to the lack of academic research into the public sector procurement. It has been noted that procurement in the public sector differs from the private sector in a number of ways, the most notable being that it is more highly regulated and politically constrained than the private sector; thus it is more bounded. The study has contributed on a number of levels here. Firstly, as was clearly highlighted in Chapter 2, there was lack of research in the area of public procurement in Ireland. The first contribution the study has made is to produce empirical data outlining the procurement process in the Health Sector in Ireland. In Chapters 5 it was shown that the process, as published to date in the sector, did not encompass the full range of activities taking place. It was found that there were activities in the procurement process that for practitioners were not being recorded. This empirical work has contributed directly to an examination of the procurement process itself.

The fourth contribution built on this by presenting a new model of procurement for the public sector. Chapter 2 outlined the four main theoretical documented processes of procurement. In the discussion and findings of this research, there is seen a contribution at the theoretical level of a new mapping of the procurement process (Table 16, page 208).

The fifth contribution the application of structuration theory as applied to the study of the impact of technology on organisations can be applied to bounded processes. Where Giddens posited structures as mechanisms or frameworks within the mind of an actor, Orlikowski envisages structures as concrete elements (e.g., designed features) of a technology artefact. A technology (or cluster or solutions) embodies interpretative schemes, provides co-ordination facilities and is deeply implicated in linking social action, structure and interaction. The theory has been applied to a process (the procurement process), which was seen as a set of enacted routines and rituals. This use of structuration theory as applied to process, does not conflict with Giddens or Whittington's views. Rather it has been found to reinforce the model. However by positioning the technology as part of a process, the interaction between technology and people becomes clearer.

The sixth contribution was that the application of technology to a process is not bounded by the organisation, but consideration needs to be given to inter and intra organisational dimensions. This built on the fourth theme of the research, which was to look at the interaction of technology and people in the context of a process, the process being defined in the same way as the traditional view of an organisation. *The adoption of structuration theory to examine the impact of technology on a process is novel and contributes to the growing research field of technology.*

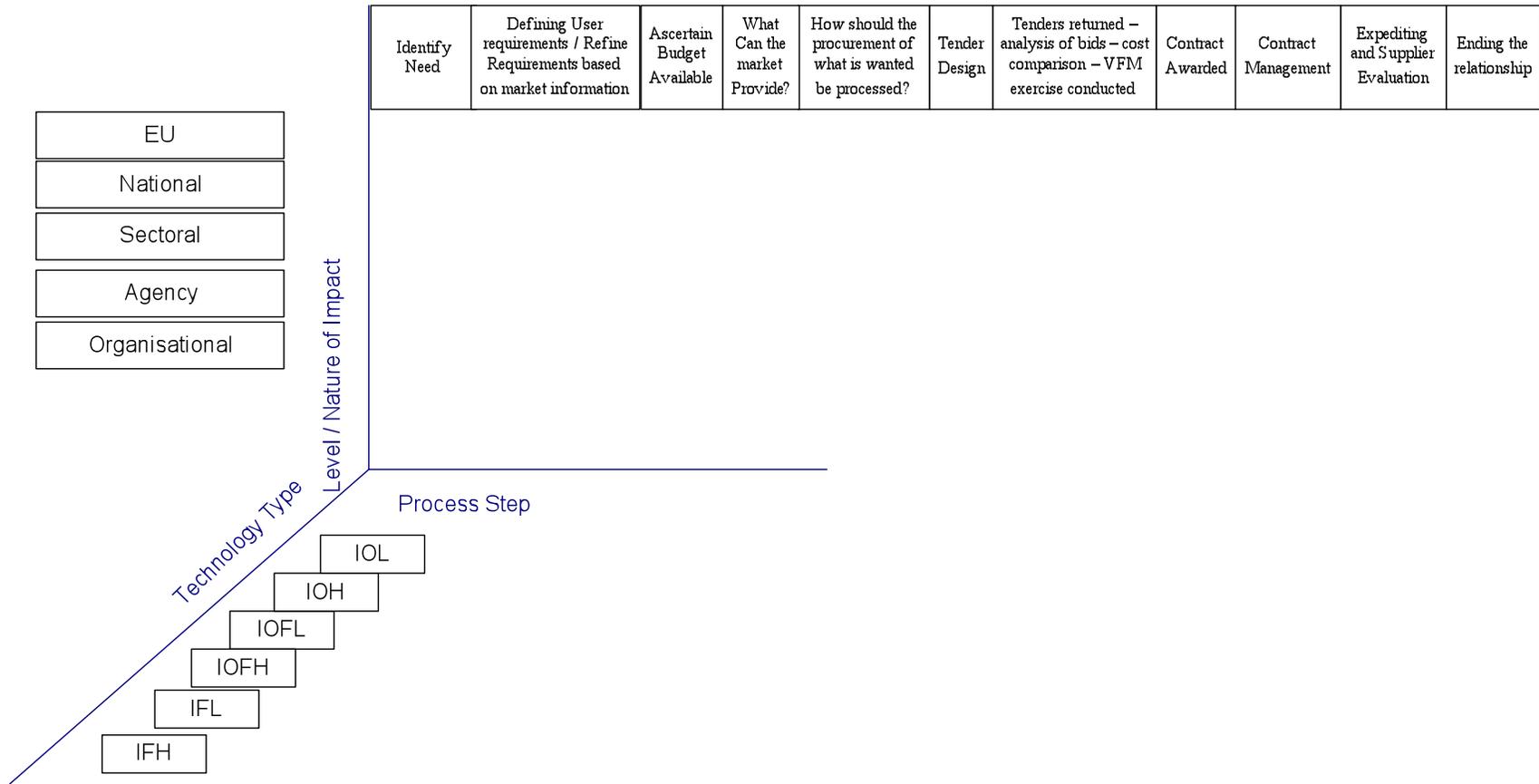


Figure 31 : Framework for the Assessment of Technology Impact on the Procurement Process

The seventh contribution was that it is essential to analyse the process at the appropriate level, to allow for isolation of different influences. Given that the public sector is a broad area. The isolation of technological factors is critical in establishing a link between the technology and the actions taken. Another contribution that has been made came from the examination of the context that the procurement process is carried out in. To aid in doing this Harland's public supply model was used. However this model was adopted to examine the context at different levels. The model worked on examining the context from the national government down. *The research here adds to this context, by looking at the public sector on a number of different levels, from European Union to Local Agency level. This not only allows a greater granularity to the process of analysis of public sector supply, it allows for the isolation of effects at different levels, which was not present in the previous model.* This is new and adds directly to public sector theory, in particular the public sector procurement, which is heavily influenced at all levels.

In summary, there has been little research on the impact of technology on the public procurement process; this research contributes both theoretically and empirically to the research here. Furthermore although there is some overlap in definition of the procurement process, there has been no clear conceptual model of public procurement process found in the literature; this research adds to the models of procurement and specifically proposes a model for the public sector. The eighth and final contribution was the development of a new framework for the assessment of technology across multiple processes and multiple contexts.

The new model incorporates the iterative steps of the procurement process and explicitly sets out where the legislative restrictions impact and have to be considered. To date the Impact of technology research has been organisationally directed and as such the focus of the research is to direct this towards process; this research adds at both theoretical and empirical level by examining the impact of technology at a process level and developing a

framework for this assessment. *This framework is novel and adaptable across multiple processes and multiple contexts.* The procurement process can be seen as embodying interpretative schemes, providing co-ordination facilities and is deeply implicated in linking social action and structure and interaction. The research thus explores this interaction within a bounded setting, “the public sector”; this is a unique contribution that is both empirically rich but also adds to the theoretical base of knowledge.

6.10 Limitations

This section addresses the limitations of the research. Partington (1997, p.262) that there are “imperfections of the research design and acknowledges the limitations of the theory-building study approach adopted” in his research. Dietz (1996), notes that outcome of any research is limited by the perspective chosen, and is at best a one-sided analysis that is unfinished. One criticism that can be held against the approach taken in this research, that of theory building is: if the theory is not tested, how can you know it holds? The research is thus unfinished in this sense. There is however an opportunity to take some of variables for further testing, and this is discussed 7.4. Because of the time limitation (as with any doctoral research), further testing of propositions have not been attempted.

Miles and Huberman (1994) identified that this type of research, qualitative, can be very time consuming and resource intensive. In collecting, processing analysing and reanalysing the three case studies and the context setting interviews I have spent an enormous amount of time. In that time I have developed a range of skills for example case selection, gaining access to case sites, interview skills, setting up and running focus groups, and of course building theories from many iterations of data collection and analysis. There is always a need to take a pragmatic approach to field access, and because of this and the balance between trying new techniques and trying to develop a more informed and critical understanding of the position and use of qualitative research, I have to acknowledge the limitation in scope of the doctoral research.

Studies of change should be longitudinal and ideally concurrent with the whole duration of the change ((Pettigrew; Van de Ven); in Partington, 1997, p.262). There was a degree of historical data collection even though the intention was to collect data as current as possible. This was unavoidable since procurement projects were being developed as the cases started, partway through or complete.

There were issues of compromise as well. These arose due to the opportunistic nature of the study and the time scale limitations, particularly when access to the current regional materials management case study may have changed due to the introduction of the HSE structures partway through the case. Huber and Power (1985) suggest guidelines for increasing the accuracy of retrospective reports by managers. They suggest, that questions should imply richness without complexity. This was found to be useful when dealing with the range of participants in the study, and in a particular with the focus groups. Partington (1997, p.262) notes, "Another related issue is the inherent shortcoming of interview-based studies, identified by Outhwaite (1987), that they emphasise language "to the virtual exclusion of the other aspects of social life"". Data triangulation was used, with data from other sources than archival data. These included notes of meetings, both formal and informal, notes taken during observational visits and notes taken after interviews or focus groups, limited though they were.

Another limitation relates to the scope of the study, both organisational and project scope. In the first stage of the fieldwork a number of context setting interviews were carried out. In the second stage, three case studies were completed. All work shared important characteristics in that they sat within the conceptual framework that had been developed. However the approaches taken to carrying out individual context setting interviews and carrying out a longitudinal case study, did give differences to approaching the analysis of the data.

Partington (1997, p.263) notes that “some research writers consider that cases should be selected for their difference of size, complexity etc. (for example Ragin, 1987; Vaughan, 1992) rather than for their similarity.” To overcome this would require a range of different projects to be studied across the organisations, but again due to the limitations of both time and resources it is doubtful that could have been overcome. This would have had to be done to fully satisfy the critics of case generalisability.

In this research it was critical that the framework be established and that the comparison of the cases should be distinct such that the approach of analysing process rather than organisation was clear.

In Chapter 2 it was acknowledged that there was difficulty separating the content of change from its process. There will always be issues in separating ‘what’ (content) from ‘how’ (process). It is critical that at each level there must be a differentiation of the what from the how. With each iteration of data analysis, there is a possibility to moving away from the core of the problem being examined. Problems were thus encountered with this research while analysing the data, which led to a seemingly unavoidable inconsistency in deciding when an instance depicted content or process as was seen in Partington (1997).

There were a wide range of participants involved in the study. Because of the limitations mentioned previously in the scope of the study, it was not always possible to control for the influence of these participants who were interpreting their organisations’ needs and sponsoring and managing the procurement projects. I focused on the differences between the circumstances under which processes were adopted but this then led to a risk of lack of attention to individual effects. There was some opportunity to address this issue in the second stage of the study by selecting the longitudinal case, as this facilitated the inclusion of individual effects within the process itself.

There is always a risk of researcher bias. Coding and condensing open-ended interview data is, predictably, a subjective process. As previous researchers

have done (Partington, 1997, p.264), there were efforts made to increase coding rigour by careful preparation and maintenance of definitions of codes, properties and dimensions. With each iteration of the data analysis, these codes, definitions, properties and dimensions were updated to try and facilitate any new development, exception or alternative explanation. A clear trail of evidence has been left such that an accurate and credible representation of how technology impacts on process has been recorded.

Despite these limitations, I have noted throughout the thesis (in particular in Chapter 3 and 4) that there is a degree of bias that will always arise from the history and experiences of the researcher. In some cases of research there may be multiple researchers working on different aspects of the case. Thus checks and confirmations of the reliability of the analysis can be carried out (see for example Gioia and Chittipeddi, 1991). Due to resource constraints this ideal was not possible. However where possible the analysis was presented at peer reviewed conferences in order to seek an unbiased view the results to date.

6.11 Chapter Summary

This chapter sets out the primary discussion on the case narratives and the analysis carried out. The discussion tied together the research themes and the research objectives. Section 6.2 dealt with the context the cases are set in. It discussed the development of the sector and in particular how this development has driven the uptake of technology and directed the procurement process. It also dealt specifically with Theme 6, examining the context that the procurement process is carried out in. Section 6.3 discussed the concept of public sector and showed how the bounded nature of the process was context specific. It then discussed the impact that this had on both the data and the interpretation of the final analysis. Section 6.4 elaborated on the development of supply chain management. It dealt with the development of a materials management background that has embedded itself in the adoption of technology and the procurement process itself. This section reflects Theme 3, which examines the procurement process in the public sector. Section 6.5 examined the technology itself, as presented in each of the cases and explored

Theme 2, which examines the technology in the context of procurement itself. The last two sections, 6.6 and 6.7 dealt with process, structure and structuration. They show how the cases contrast each other due to the complexity of the process, and the nature of the organisation. It is in putting these themes together that the framework for examining the impact of technology has been shown to be applicable to process. The framework (Figure 31) combines the new mapped process, with the contextual influences, and the type of technology implemented and is the major contribution of this research. Section 6.8 dealt with the impact of the framework. Section 6.9 outlined the contributions this research has made. Section 6.10 summarised the main limitations of the research.

Chapter 7 Conclusions and Recommendations for future research

7.1 Introduction

This final chapter presents the key conclusions to the research. Section 7.3 presents opportunities for further research arising from this study.

7.2 Conclusions

The key contributions from this research are

- that the appropriate use of technology within a process had a greater impact than applying technology across the whole process (Theme 1, Objective 4)
- it is critical to examine the context that the technology is applied in, and to assess the influence of that context (Themes 1,2, 3 and 6, Objectives 1, 2, 4 and 5)
- that stucturation theory as applied to the study of the impact of technology on organisations can be applied to bounded processes (Themes 1 and 4, Objective 4)
- that it is essential to analyse the process at the appropriate level, to allow for isolation of different influences (Theme 5 and 6, Objective 1, 2, 5)
- that the application of technology to a process is not bounded by the organisation inter and intra organisational dimensions need to be considered (Themes 2 and 6, Objectives1, 2, 3, 5)
- new and unique empirical data on the public sector process in Ireland, e.g. new data on centralised structures and new data on processes not presented before (Theme 5, Objectives, 1)

- a new model of procurement for the public sector (Objective 3)
- a new framework for the assessment of technology across multiple processes and multiple contexts (Objective 6)

The research has encompassed a range of academic disciplines, including supply chain management, public sector organisation, business process and technology. In doing so it has enabled a framework to be created that is multidisciplinary approach and can easily be understood by both academic and practitioner.

The research question, '*how can the role and impact of technology, in the context of the public procurement process, can be assessed by addressing the process as a single bounded structural entity*', was tested through the case studies and was proven to be true. A process can be regarded as a single bounded entity and as such, the role and impact of technology can be assessed in this context, so this objective has been achieved.

The objectives of the research were achieved. The drivers for the public procurement process in the Republic of Ireland since 1990 were mapped and put in both a national and European context. The internal and external drivers for the introduction of technology into the public procurement process were examined and explained within the context of the Irish Health Sector.

The objective to map the public procurement process within the Irish Health Sector has been achieved and has contributed both empirically and theoretically to the knowledge base of the field of procurement. It has been clearly shown that that technology impact on process can only be examined through an understanding of context, and as such a framework needed to be developed and tested for such an exercise. The development of the framework and its subsequent testing within the three cases achieved the final two objectives of the research.

In the empirical research (as well as stated in the literature) itself it was shown that procurement spanned the supply chain and the management of procurement in a modern organisation generally encompassed logistics management as well. This was clearly evidenced in all 3 case studies.

At the start of this research there was no other research being carried out in the area of public procurement in Ireland. Research in the area of public procurement has really only grown since the early 2000's. This research has contributed directly to the field of public procurement research both nationally and internationally.

The research has contributed directly to the field of procurement and enlarged the field by documenting both empirical but also theoretical contributions.

7.3 Recommendation and Proposals for further Research

In this section, a number of recommendations are made for both academics and practitioners. The objective of the thesis was to produce an academically rigorous thesis but with a very pragmatic application at the practitioner level. The initial set of recommendations deal with further research areas that need to be examined to develop the framework and carry out further testing. The second set of recommendations addresses the initial use of the model to assess the appropriateness of technology to support a business process.

7.3.1 Recommendations for further Research

At the start of the research program, it was not difficult to see that there was wide scope for research in the area of technology. What was not obvious was the lack of research in the area of procurement and in particular public procurement. The work to date has started to address this lack of research in the area. However it has only scratched the surface of the work that needs to be done. The work to-date has focused on the procurement process in the Health Sector, but even as the research continued, the introduction of the Health

Services Executive and the drive to centralisation of procurement functions, has opened up opportunities to further research the impact of technology. The drive to centralisation of services and processes and the standardisation of technology across the full Health Sector in Ireland offers an opportunity for researchers to apply the models established here in new contexts. These would for example find an application within a large centralised structure, rather than the decentralised hubs that were examined as part of this research. There is further opportunity to examine the procurement processes in Central and Local Government, as well as adapting the model (Figure 31, page 218) for use in the private sector.

The application of structuration theory to the impact of technology is not new, but the application of the theory at a process level is novel. There is further work to be done in exploring the generalisability of the model to other business processes.

Secondary research has emerged from this doctoral work. Initially this involved building on the inventory management model that was encountered as part of the longitudinal study but subsequently focused on the application of manufacturing optimisation techniques to services. Further research has been developed in the area of process mapping again building on the contextual model used here. The application of appropriate toolsets e.g. technologies, has initiated an international research project in the area of procurement of ICT in education. Research has been developed in examining the role of centralised versus decentralised structures, specifically as they relate to procurement organisations. The final research strand that has strong potential, is in the area of capacity and capability building for procurement professionals in the public sector.

7.3.2 Proposals for Initial use of Framework

The objective of having a thesis that was readily accessible to practitioners is ambitious. However the ambition of having a framework that practitioners can use to make assessments is pragmatic. The framework for firstly examining the

context for adoption of a technology has potential for practitioners to adopt prior to procuring technologies. The objective for any practitioner is to establish the key need and the appropriate positioning of that technology to support the process being managed. The two frameworks proposed in this research will allow managers the toolset for establishing the context that a technology is being adapted in and so ensure that the drivers for adoption are the appropriate ones for the business case they are following. The second framework allows them to position that technology at the appropriate place in the procurement process to support the process.

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Appendix 1 Initial Interview Introduction and Structure

This section outlines the interview protocols used from the initial interviews. It consists of

1. Outline Description of Work given to all participants
2. Introductory Letter sent to all participating organisations
3. Interview Templates for Context Setting Interviews
4. Interview Templates for Case Studies

Outline Description of Work given to all participants

THE IMPACT OF TECHNOLOGY ON PEOPLE, PROCESS AND COST – A STUDY IN PUBLIC PROCUREMENT

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Outline Paragraph

Achieving a significant and on-going improvement in the quality of service delivered to the public is a key objective of the current program of public service reform. However current research into the area of service delivery has failed to look at how the services are sourced and procured. There is considerable research within the area of Public Administration, particularly in the areas of policy, strategy and program evaluation. Research presented on Public Procurement has tended to focus on one aspect only, i.e. considering technology and its impact on costs or technology and its impact on organization. In this research 3 areas are examined. They are People (organization), Process and Cost.

The current research is structured primarily around one question

What has been the impact of technology on Public Procurement?

In order to investigate this question it is proposed to conduct the research using an in-depth case study of the Health Sector. This involves the onsite interviews with the XXXXXXXXX.

Introductory Letter sent to all participating organisations

June 1st 2004

Dear Mr XXXX,

I am currently researching procurement and in particular the impact of technology on procurement. This initial work is part of a doctorate I am currently undertaking with both DIT and NITL.

It is proposed to take this background work and to develop a number of case studies which will be used to support the doctoral research.

The work itself in documenting the cases could serve as cases for publication by the relevant organisations which could use them for the basis of organisational learning. The documentation could also be used to ensure that the agreed objectives of each of the areas that the progress and successes / failures of the key areas can be tracked.

I am currently starting another case with another area of the Health Sector. I therefore was wondering if I could meet with you and discuss if I could use the XXXX Hospital as a case study.

I have enclosed a copy of my Curriculum Vitae as background to myself. I look forward to hearing from you in the near future.

Kind regards

Paul Davis

1.

Interview Templates for Context Setting Interviews

Meeting Date

Time start
Time finish

Present

Key Points Discussed

Introduction to Research

Background to research outlined, current work described

Current Status of Procurement

Review of Reports

 Approach taken
 Consultative
 Interview
 Questionnaire
 Research
 Sources of research
 Experts consulted?

Outcomes of Meeting

Follow up Action Points

Interview Templates for Case Studies

Organisation / Case Study

Date

Time

Present

Questions

1. what is your job title?
2. what does the organisation do?
3. describe the structure of the organisation
4. what is your department ?
5. how many staff are there in your department?
6. describe the structure of your department
7. who are your customers?
8. what is your role in the organisation?
9. describe your responsibilities
10. what specifically are your supervisory (if any) responsibilities?
11. describe a typical day in your role
12. what information technology do you use?
13. describe how you use this technology
14. I want to go back in some more detail on your description of your Customers
 - a. Who are the your Customers?
 - i. List them or draw them on this sheet of paper
 - ii. What are each of their roles?
 - iii. What is the relationship that the your group holds with these people?
15. Process
 - a. I want to look at the procurement process
 - b. Can you describe the process?
 - c. Can you draw or map out this process, showing the key steps in the process?
 - i. Can you tell what role you play in this process?
 - ii. Can you describe the role of your group in this process?
 - iii. Can you describe the role of the committee in this process?
 - iv. Can you describe the role of the customers in the process?
16. Technology
 - a. If we go back to the process we have described and look at each of the key steps
 - b. Can you describe what supports are in place for each step?
 - i. technological
 1. Can you describe these some more?
 - ii. Procedural
 1. Can you describe these some more?

2. Is there a manual that is used?

17. What Changes have occurred in Public Sector Procurement in the Republic of Ireland since 1990?
 - a. What are the legislative changes that occurred?
 - b. What were the effects of these legislative changes?
 - c. Were they EU directed or Dáil directed?

18. What are the organisational changes that have occurred?
 - a. Has there been centralisation or decentralisation of personnel?
 - b. Has there been an up-skilling of personnel?
 - c. Has specialised purchasing personnel been introduced?
 - d. Has there or is there recognition for a certification process for procurement personnel?

19. What are the process changes that have occurred?
 - a. Where has the centralisation of the purchasing process occurred and where has it not?
 - b. Where have technologies been implemented and where have they not?
 - c. What technologies have been implemented?
 - d. What has been the impact of the technologies that have been introduced?

20. What were / are the main internal and external drivers for change in Public Procurement in the Republic of Ireland since 1990?

21. What were the internal drivers for change?
 - a. Has there been a greater focus on Quality and life cycle costs?
 - b. How has this been seen?
 - c. Why has there been an increased need to reduce process and transaction costs?
 - d. Why has there been recognition that better value can be obtained by leveraging departmental and government purchasing power?
 - e. How has this manifested itself?
 - f. What cultural changes were seen as drivers and why?
 - g. What impact did the introduction of new technology have?
 - h. What influences of programs such as the Strategic Management Initiative have on Public Procurement?

22. What were the external drivers for change?

23. What were the political changes that occurred over this period?
24. What were the economic changes that occurred over this period?
25. What were the legislative changes that occurred over this period?
26. What were the technological changes that occurred over this period?

27. What are the proposed practices and processes for Public Procurement in the Republic of Ireland at present?
28. What legislative changes are proposed?
 - a. Are there new directives or changes to directives been made or proposed?
 - b. Is there new Laws or acts been implemented which will influence Public Procurement?
29. What procedural changes are proposed?
 - a. Is there a revision to the Green Book proposed?
 - b. Does the introduction of E-procurement mean there is a requirement for procedural changes?
30. What technology changes are proposed?
 - a. What will be the impact of the E-procurement strategy?
 - b. What will be the impact of the E-Government strategy?
31. What organisational changes are proposed?
 - a. Will there be more market specialists?
 - b. Will there be more certification required?
 - c. Will there be a more centralised or decentralised structure implemented?
 - d. What will be the effect of the E-procurement strategy on National and Agency structures?
32. What has been the impact of technology on Public Procurement in the Republic of Ireland since 1990?
33. What has been the impact on Processes?
 - a. What has been the impact at a procedural level?
 - b. What has been the impact on working practices?
 - c. What has been the impact on Administration and administrative processes?
34. What has been the impact on People?
 - a. What has been the impact on the Organisation?
 - b. What has been the impact on the Human Resources within the Organisation?
35. What has been the impact on Costs?
 36. What has the impact been on Transaction Costs?
 37. What has been the impact on Unit Costs?
 38. What has been the impact on Labour Costs?

Followup

Looking back at the last set of notes there are a number of outstanding questions I would like to ask.

Appendix 2 Initial Focus Group Structure

Outline of Focus Group Workshop

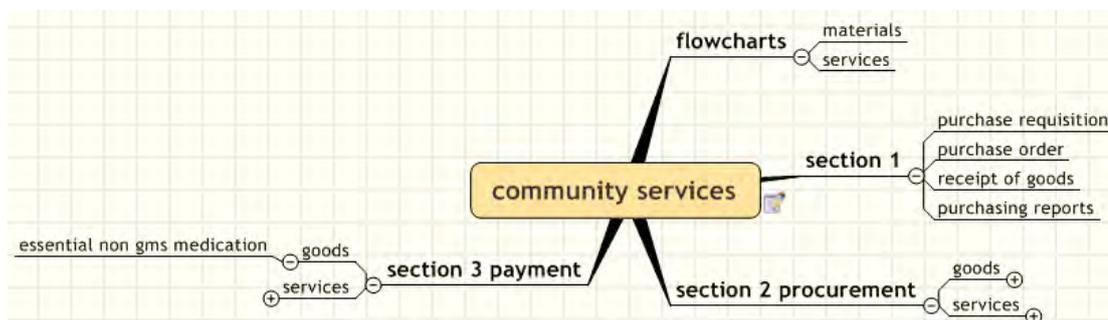
Workshop

Present

Outline of Workshop

- | | |
|-------------------------------------|------------|
| • Introduction to Research | 10 minutes |
| • Common Definitions | 5 minutes |
| ○ Checking on agreement | |
| • Breakout into 2 groups | 30 minutes |
| • 1st group map out materials | |
| • 2nd group map out services | |
| ○ Break | 10 minutes |
| • Reform 2 groups | |
| • Swap maps | 20 minutes |
| • Group 1 present map | |
| • Agree map | 10 minutes |
| • Group 2 present map | |
| • Agree map | 10 minutes |
| • Wrap up | 5 minutes |

Initial Mind Map from Focus Group with Community Services



**Appendix 3 Transcript of Description of Procurement Process
at RMMG**

What I am going to do is actually draw it out in 2 processes, one a consumables contract that would be renewed on a biannual or annual basis, secondly is a piece of equipment or a specific request where we are asked to procure something. Take the consumables first. Basically what happens the trigger for that would be the fact that a contract needs to be renewed, its ending date is coming up. As materials management what we would do, we would inform the general managers of the services to nominate users, end users, of the consumables that we were looking for. From those nominations we would form a user group, which would be made up of end users, be they nurses, clinicians, whatever. We would also get representation from the supplies chain, supplies officers. We would sit on that group ourselves as the commercial evaluators.

...Within the group as commercial evaluators we are also leading process, or facilitating the process. These here would be our customers in the group the end user. In the first instances what we are trying to do from the tender process is find acceptable product to these end users. Now if 6 items are tendered and 4 of them are deemed acceptable, we would say ok, we know that these 4 products would satisfy our end user customer. The job for us now is to find out which of these 4 is the most economically advantageous to provide information to the budget holder on what their costings are going to be

Budget holders- take community services, the general manager of community services, it could be a hospital administrator who is managing a budget or a department head who is managing a budget. Somebody that, if you take somebody in community services who is responsible for patient transports, and lets say for arguments sake they have 20,000 a year to spend on patient transport services. It's our job to ensure that 20,000, they can get the maximum mileage for that 20,000... The end user would be the social worker (not the patient) that places the order with the contractor.

...The social worker in this instance would form part of the user group, but the budget holder, the service manager would not.

....There are two customers, the budget holder and end users. .. So we find multiple roles... A lot of our end users would have no control over the budget. A lot of our budget holders would not be the appropriate person to choose the

correct service. So there has to be something that is pulling it together, so we feel our user group is what is pulling the acceptable products together.

Take the Louth Meath hospital group. You have the general manager of the Louth Meath hospital group, he will have 3 hospitals under his control, within each hospital there is a finance person, and so they are the budget holder effectively for that hospital ... The users within that might be the nursing sister...

...There would be policy procedure for ensuring good governance...this person; the budget holder is feeding back into the general manager how well they are up on budget in their particular service in the organisation ...

I would say that we have discussed above is specific within the contract management group.

Looking at the RMMG,

...A second scenario is for contracts, we could get a specific request from somebody who wants security services, and they want to find a contract for cleaning service or security services. In that instance there your customer is directly your budget holder because they have approached you, they have 50,000 maximum which they can spend per year on this service so they to contract for it, to get someone in within the budget they have. So you are not overly concerned because there is not an end product here, and you are solely working for a budget holder in that instance, because it is a very specific request in that they have a budget of a specific amount to do something and they want to do it. For renewables there is per se a clearly defined budget, say there is 2million to spend on medical and surgical products this year, that is it if the 2million is gone there is nothing else, its demand driven....

One is driven by demand; the other is driven by budget itself...

...The second one is the budget holder directly contacting contracts to carry out procurement, there is no user group.

...We have to separate the two, in theory the process is the same, its open fair and transparent, but the steps taken are different...

...If we are going for a renewable contract, the first thing we are going to look at is what are we purchasing,, we are going to contract more, if we decide its going

be say medical and surgical products, what is our expenditure on the items from sap 1. We have to ask ourselves then, there are 3 questions,

- Who are internal customers/ users*
- Who are suppliers*
- What method best suits the tender process, in terms of the tender process, do we know open, restricted ...*

When we have identified our internal suppliers and customer s and we have decided its best to go for restricted, we will then sign off on products for tendering with internal customers. After we have that done, we will agree specifications if required and award our evaluation criteria for the products.

Next job is to publish the tender, to the open market and inform know suppliers

....Once a tender closes it is then in most instances a 3 stage evaluation, of product, supplier and costs, generally what would happen is there is first run look at the supplier and first run look at the cost, because product evolutions generally take a bit of time to organise, then there would be a product evaluation, from that there would be a second run on supplier and a second run on the costs, so what you come out of here, is that if there was 10 bidders you would have them ranked 1-10 in each evaluation. So then using some form of decision support model you are looking at the three different elements and the way in which comparisons are agreed. So for arguments sake you might say, that product is worth 30%, supplier is worth 30% and cost if worth 40%. So obviously the weighting there, while you might be two here and here, being first 2 there, well the weighting could favour you.

So we agree the award decision with the user group, then forward to budget holder / service manager for approval. Then award the contract and load to SAP for purchasers to draw down from.

11 very easy straightforward steps, it obviously does not always go as straightforward as that ...

That's the general flow for consumables...

The other one, well the budget holder contacts contracts with requirements, be they budget requirements or service requirements. We develop spec and if required a user group of relevant stakeholders

...Advertise for competition, again the 3 stage evaluation, product/ service, supplier, and cost. Decision support model, approval of decision from budget holder, then seven is the award of contract.

We have to set down the rules, we are only going to contract for things we are purchasing on a regular basis here, we will not contract for once off because this is a considerable contract, so there has to be certain rules .. So that is decided by us. But the expenditure items, reports those reports come from ourselves

....We have to be aware of what the value of this is, we have to be able to identify the internal customers, who are the best people to pick if this product is acceptable or not, our own market knowledge should tell us who the suppliers for this are, who we are currently buying this product from, and then as I say, looking at the expenditure who our internal customers are, who the suppliers are, deciding on which procurement process best suits, whether we go open or restricted, sign off products for tendering with internal customers, that's really getting that they are satisfied that they are happy, yes we understand what you are going for here, and we are not leaving out something or that we have something in there that we shouldn't be buying,

agreement on specs for evaluation criteria, that's an advice role because, there is nobody here with any expertise in medical products, someone has to give us a specification, we will have them in terms of, what's your needs, what's your musts, what's your desirables, the bar is not put so high that nobody can enter the competition, similarly in our evaluation criteria, that's is based on again, the bar not being set too high, but that's its fair and open, but they have to pick the evaluation criteria,, we couldn't do that we would not have the expertise here,

Publishing the tender is all done through here because there are certain rules on clarifications of tenders and that; we have a system here so we do that. The 3 stage evaluation... we can facilitate and organise the product evaluation taking place, but we have no role in evaluating the products, this can only be done by the users. We can do half of the supplier evaluation, we can check out the financials, is the company, but in terms of what this companies actual service is on the ground, not being a purchaser or user we cant do that, we have to get our supplies people out there... the cost element is something only we can do and it is only looked at, at the end of the process that we let other people know what the cost is.

The DSM, we have to agree with the user group what is the, the important deciding factor here, but I suppose we would be starting with costs, then that is our priority. If we decide cost is going to be 50%, and 25% is each, you have to argue each % ...

Agreeing the award decision with the user group is like going back up agreeing the products. We need them to agree that they are happy, that the product... what could come out as no.1 for them may end up after the DSM being no.4. So they have to be prepared to accept the final decision... Before handing over to budget holder / manager, we have to take responsibility that as a commercial leader / process leader that we are looking after this recommendation and getting their approval on it.

The award of the contract and getting it up onto SAP is our responsibility as well. So in each step there is an element of where we do something. Some cases would be more to the front ...

DBRMMNEHB

Transcript of Total Inventory Management System

“Basically up to the point where TIM started to be implemented, sorry I should start probably, when the health board buys stock that is held in a central

supplies department it is in a suspense account. It is not charged or expensed until it hits the cost centre and a ward is a cost centre. I've been stock taking for years when I was a supplies officer and obviously I could see when I went to a ward that stock was being held in a very higgledy piggledy way in very poor infrastructural conditions, presses full to ceilings and so nobody could get at them. And people were over stocking, one instance when we went to a ward there was 31 boxes of a particular needle as a matter of interest I checked with the supplies department and they suggested that they carry 10, and that ward had 25 patients. My question was then how do I control. One of the difficulties with the way we did things is that we had for each ward the 100 or 200 most used items on a list, with 10 columns on it, basically we would use the first column for week 1 and when, in terms of the supplies department it was entered on the system as a reservation or whatever, added to the picking list. We simply drew a line through the column. The difficulty with that was if it was a junior nurse who was on the ward, she would look at what was ordered last week and would say ooh we better get that, I'm not going to get my ass kicked, so it was just in case stock instead of just in time stock, and then we would go onto wards and if a junior nurse was on we would get the keys and find the strangest of things in the strangest of places. So that was one aspect of what we were looking at. Another aspect, well one of the problems with SAP was that when a nurse was reserving items on SAP she could only reserve if it is stock item, but she has no knowledge if it is stock in the central supplies department, but I was saying she shouldn't need to know, she knows she needs green mugs and that's the end of the story I want them, I need them, I'm going to use. So we went back and spoke to nurses and we spoke about different ways of doing this, we then looked at SAP, and we looked at ways of doing it simpler, the shelving the system was dire in each place. So we did a pilot with Lin Bins on a wall and we put a barcode that simply replicated the number of the item in SAP, we went into each ward at predetermined times, we scanned the barcodes and counted what was there and we entered it. We went through all the bins and we said that's grand and the system said there is 5 there should be 10, so give them 5 ... grand, but we felt it was taking a lot of time. So we looked around and saw other ways of doing it and we basically developed a kan ban system, and we put this to a nurse or two and we gave them the idea that we were now going to

manage their stocks for them, but they would agree what the levels would be so we would always refill with half what the level should be, so that they obviously had the other half. We put this to a number of groups, and they thought it was a good idea and came up with suggestions how we might tweak it so we eventually came up with a system that simply said that we take all the stock back off the ward as far as the system is concerned. We would set up a storage location at each ward, we used a kan ban system which is in effect a double bin system we have a label on the front, the nurse uses from the front she has a label which she never had before, which tells her what's there, when she comes to the end of that group of items she dumps the back box into the front, she continues to use, she turns the box around, the label now becomes a bar code, the supplies people go to the ward at predetermined times, generally on a weekly basis. They scan all of the bar codes visible to them.

One of the difficulties that we encountered was that if I'm having a cardiac arrest on the ward and the nurse goes to get a needle and it's the last one in the box, she's unlikely to turn the label, so we had to agree with the ward people that an hour before we were due to arrive, and we would give them a time we would arrive after, that they would simply send somebody into the room and check that there bins empty or near to empty. We would simply scan those. We got the system to produce a picking list based on that, that picking list was charged to the cost centre so they were being charged in retrospect for last weeks usage. We would then go back and load the shelves for them so we were giving a customer service that is how we sold it. Rather than dropping a box in the middle of the floor as did before we would go back and load the shelves for them. That gave us 2 things, they only had 1 place for stock items difficult to hoard and stock was turned in a proper fashion and the levels remained at the level they should be and the nurse going back to, she needs to put her hand and find a needle when she needs it and she can .

Current status is that it is in Navan general hospital, it is in every ward, it's about to be implemented in Theatre. In Louth county hospital it is in 6/8 wards and going to be implemented in the other 2. Of the 25 wards in the Lourdes hospital

it is 9 at the moment and is being actively put into the rest of them”.

KKRMMNEHB

Appendix 4 Initial Coding List

Code	Descriptor
D1, D3, D5, D8, D9	Drivers directly impacting the procurement process
D2, D4, D6, D7	Drivers impacting level below in terms of environmental / organisational impact
CPP	Current Practice / Procedure
GI	Government Initiative
IDC	Internal Driver for Change
EDC	External Driver for Change
IDT	Internal Driver for Technology
EDT	External Driver for Technology
MCP / MCPH	Manual Changes (Health)
T1 -TTP /T1- TTPH	Technology (Health)
BPP / BPPH	Process Re-engineering (Health)
OSP / OSPH	Organisational Structures (Health)
CSDH	Competency Skill Development Health
IOL, IOH	Interorganisational
IOFL, IOFH	Intraorganisational / intrafunctional
IFL,IFH	Interfunctional

Appendix 5 Interviews and Instruments used

Interviewee	Organisation	Instrument	Recording Tool
CBDTCENT	CENTRAL	QI	NOTES
CRPACON	CONSULTANCY	QI	NOTES
PKIBCON	CONSULTANCY	QI	NOTES
CDIBADV	ADVISORY	QI	NOTES
CTDFCS	CENTRAL	QI	NOTES
LSHBMM	HEALTH	QI/OBS	NOTES
RBRMMNEHB	HEALTH	QI/OBS	NOTES/REC/TRN
ABBEMM	CASE2	QI/OBS	NOTES/REC/TRN
PABEMM	CASE2	QI/OBS	NOTES/REC/TRN
TKDDMM	CASE1	QI/OBS	NOTES/REC/TRN
DLNGHNEHB	CASE3	QI/OBS	NOTES/REC/TRN
MOHSTFNEHB	CASE3	QI/OBS	NOTES/REC/TRN
DBRMMNEHB	CASE3	QI/OBS	NOTES/REC/TRN
KKRMMNEHB	CASE3	QI/OBS	NOTES/REC/TRN
BKRMMNEHB	CASE3	QI	NOTES/REC/TRN
ARRMMNEHB	CASE3	QI	NOTES/REC/TRN
JGRMMNEHB	CASE3	QI/OBS	NOTES/REC/TRN
RGRMMNEHB	CASE3	QI	NOTES/REC/TRN
PMRMMNEHB	CASE3	QI	NOTES/REC/TRN
CARRMMNEHB	CASE3	QI	NOTES
KDRMMNEHB	CASE3	QI	NOTES
SRRMMNEHB	CASE3	QI/OBS	NOTES
CSNAVCS	CASE3	FOC/QI/OBS	NOTES
JSMMHB	HEALTH	OBS	NOTES

QI QUALITATIVE INTERVIEW

OBS OBSERVATION WITH NOTES

FOC FOCUS GROUP

REC RECORDED WITH MINI CASSETTE

TRN TRANSCRIBED

Note More than 1 interview was carried out with some participants over the course of the research

Appendix 6 Sample Conference Papers

These are 3 sample conference papers delivered over the course of the thesis. The thesis reflects a continuous interaction with peers through conference papers and discussion. These papers are presented in the formats that were submitted

The Impact of Information Technology on People, Process and Cost – a Study in Public Procurement

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Summary

Examined here are 3 areas People (organisation), Process and Cost. Illustrated is how all three areas are inter-related and therefore cannot be treated separately. The proposition is that ‘The introduction of technology into the procurement process within the Public Sector of the Republic of Ireland leads to fundamental changes in the processes, organisational structures and costs.’ It is proposed to conduct the research by using 3 research methodologies; literature review, cross-sectional survey and an in-depth case study of three selected cases; Health, Local Government and Central Government sectors.

Keywords: Procurement, People, Process, Information Technology

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Introduction

This research is focused on the public sector in the Republic of Ireland. There has been considerable change in practices and processes over the past 10 years with the modernisation of the public sector. Programs such as the Strategic Management Initiative, Management Information Framework and more recently the Benchmarking review have brought the processes of the sector into the public forum.

As a background to these changes, technology has changed over the past 10 years. This change in both the technology and the way it is applied is affecting both the structures and processes of the public sector. Current research in Ireland has failed to look at how services are sourced and procured. Although there is considerable research in the area of Public Administration particularly in the areas of policy, strategy, and programme evaluation, public procurement has not been an area of focused academic research.

Research in procurement has concentrated mainly on the private sector, and although there is now a wide range of research happening in the field of public procurement outside of Ireland, it has tended to look primarily at single dimensions, i.e. the impact of technology on costs or the impact of technology on structure.

The research examines the inter-relatedness of three areas, people, process and cost, and the impact that technology has on these areas within the public procurement process.

The proposition is that ‘the introduction of technology into the procurement process within the public sector in the Republic of Ireland leads to fundamental changes in the processes, organisational structures and costs.’

This paper sets out the background to the research. It will look at current models in use. It will then set out the methodology being taken and the current status of the research.

Background

In the last 10 years there has been a growing interest in Supply Chain Management. This interest has been primarily focused on the private sector. Supply Chain Management has been used interchangeably with Logistics Management, Materials Management and more recently the emphasis has shifted towards procurement. Perhaps the simplest explanation is to think of a supply chain as having five distinct parts Buy, Make, Store, Move and Sell. Across these five parts are processes that control the supply chain. Information is passed through these various stages. At each stage there are a number of sub-processes which can be defined as processes in their own right. What we then see across a number of definitions (Christopher, 1998, Simchi-Levi et al, 2000, Council of Logistics Management) is a common theme of the supply chain being a process. It is also evident that information related to the process is critical and fundamental for the control, management and understanding of the process.

McCormack and Johnson (2001) define a process as '... a specific group of activities and subordinate tasks which results in the performance of a service that is of value'. When organizations public or private, are examined it is clear that the process view of the organization tends to differ from the traditional functional view. This is clearly seen in Table 1.

Insert Table 1 here.

A process view can be taken of procurement. This is illustrated in Figure 1 below. This view can be applied to the Public Procurement Process. It has been seen that traditional purchasing compared to modern procurement has tended to concentrate on the 3rd and 4th stages of the process only.

Insert Figure 1 here

The view of processes is further complicated by the lack of academic research into the business process management. Meláo and Pidd (2000) highlight four different perspectives on business processes. They state that business processes can be treated as deterministic machines, as complex dynamic systems, as interacting feedback loops and as social constructs. These views can be represented on a continuum (see Figure 2) and are best represented as inter-related facets of a multifaceted reality. Each perspective makes different philosophical assumptions about the nature of business processes, and thus will influence the perspective taken by the researcher in mapping them. In addressing the research and the process of procurement, the approach taken to map the process will have consequences for the epistemological viewpoint taken. It may also influence the data collection in the cases chosen.

Insert Figure 2 here

With the changes that are occurring in both the Private and Public Sectors it has been concluded that modern procurement is not about doing what an organization already does better, it's about doing things differently.

Procurement then is seen as including all the activities required in order to get the product from the supplier to the final destination. It encompasses the purchasing function, stores, traffic and transportation, incoming inspection, and quality control and invoicing. Some organizations would also include salvage and environmental issues as well. Procurement spans the supply chain as defined previously and the management of procurement in a modern organization encompasses Logistics Management as well.

The definition for the research is that procurement ...the whole process of acquisition from 3rd parties and covers goods, services, ICT, and construction projects. This process spans the whole life cycle from the initial concept and definition of business needs through to the end of the useful life of an asset or end of services contract' (Gershon,1999)

Public Procurement in Ireland

The literature emphasizes in the main Logistics, Supply Chain Management and Procurement in the Private Sector. It is estimated that in Europe the value of public procurement amounts to EUR 900 billion or 12% of Community Gross Domestic Product for the member states (Figures relates to 1995: EC, 1999). In Ireland alone, the total non-payroll spend, (excluding the commercial state bodies), for the public sector as quoted in the E-Procurement Strategy, October 2001, is approximately EUR 8.5 billion. Of this EUR 4.73 billion is spent on supplies and services with the remaining EUR 4.12 billion being allocated to Works procurement.

This huge amount of money is being spent by a large number of government institutions on a wide variety of goods, services and projects. The spend is fragmented across a wide range of sectors. The biggest sector being the Health Sector with a spend of € 1.5 billion per year on the purchase of goods and services for direct patient services.

The E-Procurement Strategy produced by PricewaterhouseCoopers, outlined proposals for the development of e-procurement to streamline the public procurement process. O'Connor (2003) noted "...the projected cost of taking the big bang is huge. While in the longer term there may be considerable savings, the history of failed investments in technology and the prospect of a long payback period are considerable constraints to moving forward." Furthermore the major structural / organizational and technical changes proposed are skeptically looked upon by the public sector itself.

Currently the Department of Finance is leading a number of initiatives which have come from a strategy proposed internally within the department. This has led to the Department teaming up with the Health and Local Government Sectors, and with the Department of Defense, Justice, Welfare and the Office of Public Works. The strategy focuses on four key strands – building organizational capacity to maximize savings, developing people to sustain improvement, reducing costs through aggregation of demand and improving efficiency through technology. The strategy is being rolled out under the auspices of the National Public Procurement Policy Unit. It is though interesting to note that although the Health Sector has committed to supporting the policy, it has recently undertaken a review (Report by Accenture is waiting to be published) of its strategy. Prior to this report being published and approved, the Health Board Executive (HeBE) updates its procurement policy document.

Public Procurement Research

Public Procurement Research is a very broad area. The research here focuses on the impact of technology has on the public procurement process. A number of definitions of technology are offered as starting points for this research. These include

Fletcher (1991)

- Information Technology (IT) is the acquisition, processing, storage and dissemination of vocal, pictorial, textual and numeric information by microelectronics-based combination of computing and telecommunications.

Weill (1992)

- IT includes all hardware, software, communications, telephone and facsimile facilities

De Boer (2002)

- Electronic procurement can be defined as using Internet Technology in the purchasing process – excludes old applications like ordering by telephone or by fax

For the purpose of the research the definition offered is that information technology should be viewed as the whole system rather than as separate technologies (Brady 2003). As Brady points out “...the trend in isolating and researching IT’s individually ignores the collective and cumulative impact of IT..., which a holistic view provides.” It is also noted that IT is viewed by managers in clusters and should therefore be researched in that format.

To study the impact of IT on the procurement process, one has to look at how IT is assimilated into an organization. The work of evaluation of IT however is different to way that it is assimilated. In the case of this research the work is focusing on how the IT is being used, what changes has it brought about, and is still to bring about. Therefore the stage an organization is at in its assimilation is more critical than an evaluation of the IT using financial assessments, information economics, portfolio methods, balanced scorecards.

It is worth considering two models that show the development of IT and the assimilation of the IT by an organization. Ward et al (1990) developed a model that distinguishes three periods: a DP era, a management information systems era and a strategic information systems era. This model is focused not on the different eras of hardware technology but rather on the use that systems are directed. In looking internally at the organization Nolan’s (1979) six stage model suggests how an organization follows distinctive stages of growth. This growth is related to the different types of applications being used. In this later version of his model, (see Figure 3) Nolan identified a major change in the management of organizations data processing function, as a shift from the management of the computer to the management of the organizations data resources. The danger with this model as Friedman (1989) noted, is the problem of tenses, organizations are unclear as to whether something has already been done or whether it is merely thought about. This raises concerns when using the model to assess

where an organization is. However given that reservation it allows the research to compare and contrast the use of IT in the public sector.

Insert Figure 3 here

Further work has been carried out by Barras (1986) in his studies of changing patterns of IT in service sector organizations. He characterizes these changes as representing three types of innovation, improved efficiency, improved quality and new or improved services. The key point of this model is that IT was initially introduced to automate manual back office functions, improve efficiency and reduce costs of internal processes. As gains in efficiency were achieved, It use became directed towards improving the effectiveness and quality of existing service activities, such as speed of response or the availability of on-line services. The third type of IT use features the development of wholly new services available to the customers and users of the organization.

Zuboff (1988) suggested a three stage framework model, that of automation, information and transformation. Automation links to the viewpoint that IT since its development has been seen to primarily automate previously manual systems and has been used extensively for routine and tactical activities to improve efficiency. Information provides increased effectiveness and moves the IT development processes to a higher level of benefit. The transformational stage defines an organization with new operations and practices. Adapting these frameworks, the research examines what stage the organization is at. This allows a framework to be developed for analyzing the IT in relation to the organization and the process of public procurement.

De Boers model for assessing the impact of electronic procurement gives an indication of how one element of IT that of electronic procurement impacts on costs. As noted in the paper, though the impact of implementing a form of EP in an organization may relate to four areas, organization, IT, cultural and financial. Similarly this research states that ‘the implementation of IT in an organization for the procurement process has an impact on people (organization), process and cost’. The descriptions by De Boer allow a framework and language to be adopted which enables the current research to assess what the impact of IT has on the costs. The difficulty in the public sector is that the measurement of cost is a new phenomenon and as such there is little base line data available. Primary data collection will include some basic cost gathering.

Harland’s (2000) conceptual model for public sector supply, offers a framework for analysis at the top level of public procurement policy. It offers an opportunity to assess the drivers and factors that have influenced change in the public sector procurement arena. It will allow for the isolation of the technological factors. For the purpose of this research the isolation of technological factors is critical in establishing a link between the technology and the actions taken. Although Harland’s model is designed for the UK public sector, and in particular the health sector, it is worth noting at this stage that the model itself has not been tested in the Irish context.

Insert Figure 4 here

Heintze and Bretschneider (2000) explore whether restructuring in an organization occurs after information technology implementation. They found that IT adoption has little impact on an agency’s structure and where restructuring has taken place it has only very minimal effects on performance. Their findings are important in the context that they examined public sector agencies, where restructuring may be limited due to the

nature of the organization. Unlike in the private sector where the implementation of IT should have a return on investment, be that in performance or a reduction in head-count, some re-organization inevitably takes place. In public sector, a reduction in headcount may not be possible, and minimal re-organization may take place. This will be examined further in the research. It is particularly important in the Irish context, given that the E-Procurement Strategic Plan outlined major restructuring requirements as a result of implementation.

Current Research

The proposition being examined is that “The introduction of technology into the procurement process within the Public Sector of the Republic of Ireland leads to fundamental changes in the processes, organizational structures and the costs involved”.

The current research is structured around 5 questions.

- What Changes have occurred in Public Sector Procurement in the Republic of Ireland since 1990?
- What were / are the main internal and external drivers for change in Public Procurement in the Republic of Ireland since 1990?
- What are the current practices and processes in Public Procurement in the Republic of Ireland at present?
- What are the proposed practices and processes for Public Procurement in the Republic of Ireland at present?
- What has been the impact of technology on Public Procurement in the Republic of Ireland since 1990?

In order to answer these questions the research will examine current models of procurement in 3 sectors; Health, Local Government and Central Government. The research is being conducted using 3 research methodologies. They are a literature review, cross-sectional survey and an in-depth case study of three selected cases. Secondary research was required to see what work has been done in this area. The approach taken had to be broad enough to allow for the nuances that business processes have in different organizations and that it should be specific enough to allow for replicability.

The objective of the questionnaire is to look at the how the process of procurement has changed due to the introduction of technology. In designing the questionnaire there are three areas people – organizational structures, process – procedural, manual and automated, and costs need to be examined.

The outcomes from the questionnaire will be

- To check that that there has been a change in the procurement process due to the introduction of technology
- To show that people (organizations), process and cost show up as inter-related factors

- To illustrate that the concept of technology is clear
- To validate that the sample initially chosen for the case studies is robust
- To ensure that a record of the general experience and knowledge that is in the area of procurement within the public sector is obtained

It was originally proposed to use the Irish Institute of Purchasing and Materials Management (IIPMM) web site as access to its members, but this would have limited choice of participants. The assumption if using this database would be that only members of the IIPMM are responsible for purchasing decisions in the public sector – initial conversations with a number of subjects have stated that this is not the case, so a sample criterion still has to be set up.

The criteria for the choosing the sample population will now be based on the following questions

- Does the person have responsibility for purchasing
- What do they purchase – i.e. consumables, capital goods or services (other categories may apply – a definition will need to be developed for what areas need to be included
- Is the persons part of the committee assessing purchasing decisions or do they purchase on their own
- Are they a full time purchasing professional
- Are they in an ancillary service department but are responsible for purchasing

At present these questions are being used to narrow the population surveyed down to a manageable level whereby the case study data set can be identified. The design of the survey is still to be finalized. The questionnaire is aimed at the public sector. It is not directed at private sector purchasing. This area covers central government, local government and the health sector.

The case studies will be focused and in-depth in 3 areas, Health Care, Local Government and Central Government. The rationale for using the case study approach is that there a number of processes and interactions such as social functioning and personality in the procurement process which cannot be studied effectively except as they interact and function within the bodies/entities themselves. In the main the case studies will take into account a number of considerations. These will in effect note that a ‘clean theoretical slate’ approach to case study building cannot be taken. This supports the view that Eisenhardt (1989) stated, that the research purpose, site selection, and information gathering requires some rationale, indicating at least some theoretical basis

It is proposed to take a positivist approach. This is on the basis that the procurement process can be readily described by measurable properties (models). This is in line with Orlikowski and Baroudi (1991, p.5) who classified Information Systems (IS) research as positivist, if there was evidence of formal propositions, quantifiable measures of variables, hypothesis testing and the drawing of inferences about a phenomenon from a sample to a stated population.

As Yin (1994) explains it will be exploratory, there may be some a priori theory that is used to select the case sites and the constructs to be examined. The output is planned to be proposals developed based on the observations at the three sites chosen. The operational constructs proposed will be redefined and developed further. It is hoped that

the use of multiple sites may be maximally different to highlight the commonalities and differences in the observed phenomena.

The secondary reasons for the choice of case study is that it is now being recognized as the most common form of qualitative method used in information systems research (Orlikowski and Baroudi, 1991; Alavi and Carlson, 1992). It has been concluded by Benbasat et al (1987) that the case study approach is suited due to the interest shifting to organizational issues from technical issues.

Current Status of Research

Currently the questionnaire is under construction. It is planned for this to be issued in July, and follow-up to occur from September onwards. A pilot case study has been agreed within the Health Sector.

Background to Pilot Study

The Irish health service is in a period of transition. Recent reports on organization and financial management have demanded an even greater focus on value for money and “lean” thinking across the service. The Health Board Executive (HeBE) was set up by the Minister for Health and Children. Its board comprises the chief executives of the seven health boards in Ireland, the Eastern Regional Health Authority and its three area health boards. It was established to enable joint working between Health Agencies. The Regional Materials Management Groups and in particular the Regional Materials Manager is the principal initiator / interpreter of purchasing policy and procedures in the Health Agencies in Ireland.

It is planned to carry out this case study with the Regional Materials Management Group (RMMG) of a Health Board. The role of the RMMG is defined clearly by the HeBE. They have responsibility for the central procurement of all goods and services for the regional authority, the development of policy and procedures, as well as Inventory Management and Systems Development. The RMMG plays a significant role in the Procurement Process for the Health Sector. A longitudinal case study is being designed with the RMMG. It is planned to use this case study as an exploratory study in the Health Sector and to replicate the work with two other Regional Management Groups.

At present the work plan is being finalized and will be presented to the RMMG by the end of March. It is also planned to explore the possibility of working with a shared services centre in the Health Sector.

Work on the local government agencies has yet to begin. A case subject has been identified. The case study subject for the Central Government agency has yet to be identified.

Conclusions

The current interest in e-procurement and its applications for the public sector make this a relevant and timely research topic. The models currently being used for looking at procurement have either been focused on the private sector or on public sector bodies outside of Ireland. Given the growth in the use of technology, the proposed changes to the structures of the public sector and the rising cost of managing the sector, it is

appropriate that the research be focused on the impact that technology has on People, Process and Cost.

This paper has set out the background to the research. It has described the current profile of public sector procurement in Ireland. It has set out the models proposed and has described the methodology. The current status of the research has been described and the background to the initial pilot study illustrated.

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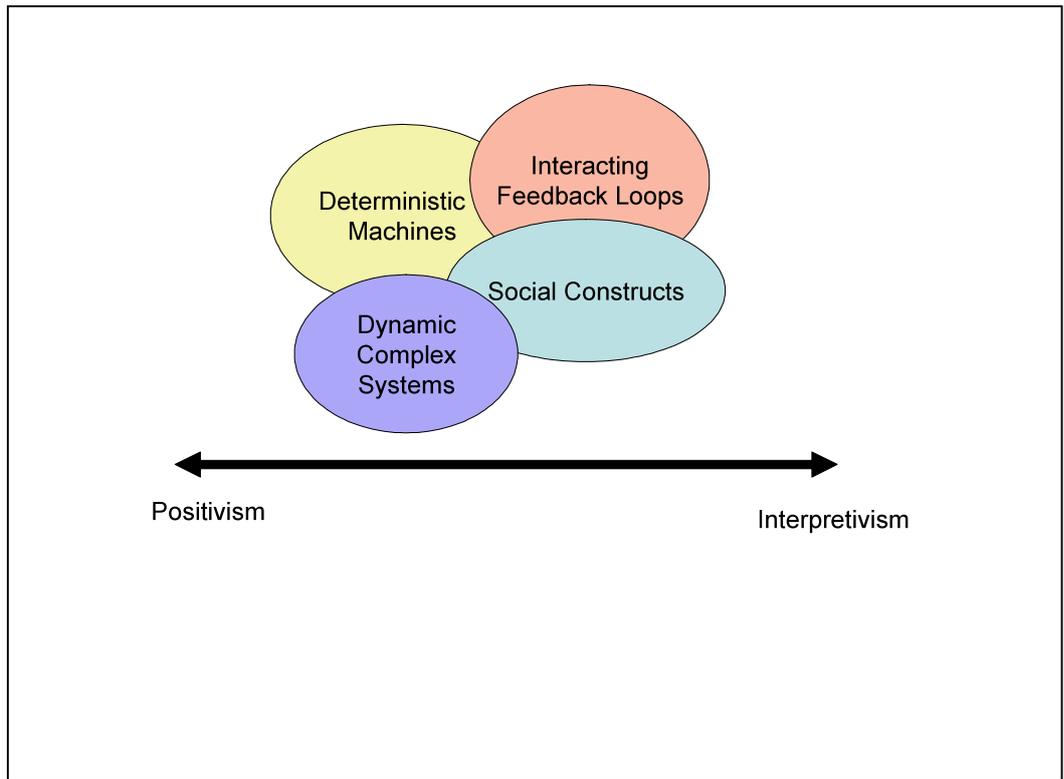
Tables and Figures

Table 1 Process View vs. Traditional Functional View

Process View	Functional View
Emphasis on improving “how work is done”	Which products or services are delivered
Cross-functional co-ordination, teamwork stressed	Frequent “hand-offs” among functions which remain largely uncoordinated
“Systems view”, i.e., entire process is managed	Pieces of the process are managed
Customer Orientation	Internal/company orientation

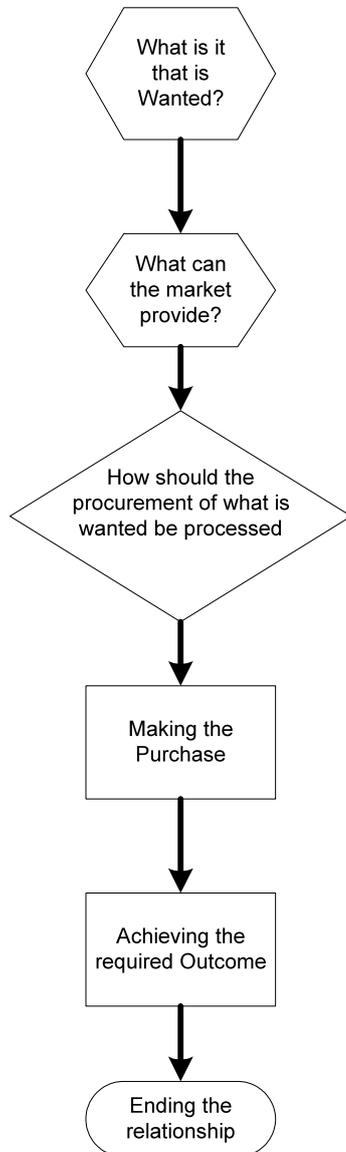
Source : McCormack, Johnson, 2001.

Figure 1 Business Process vs. Philosophy



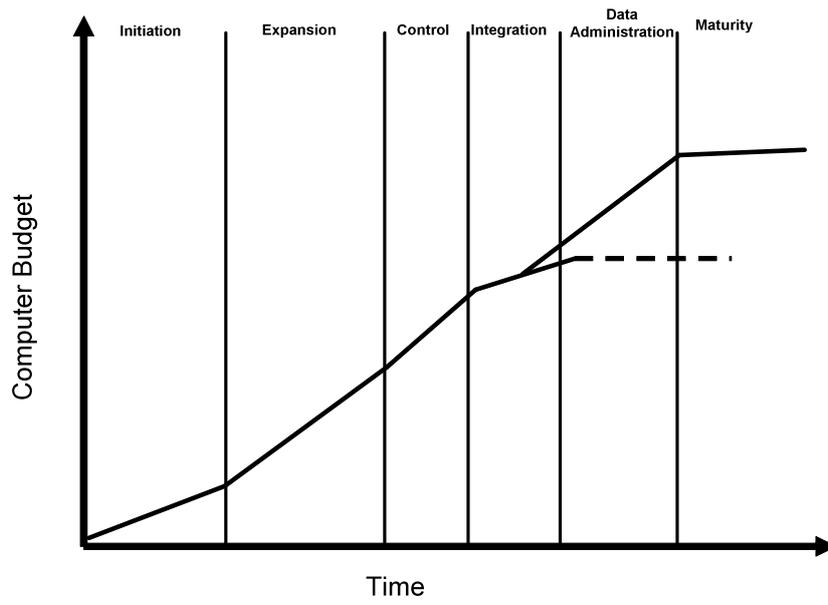
Source : Melao,N., Pidd, M.,(2000)

Figure 2 Procurement Process



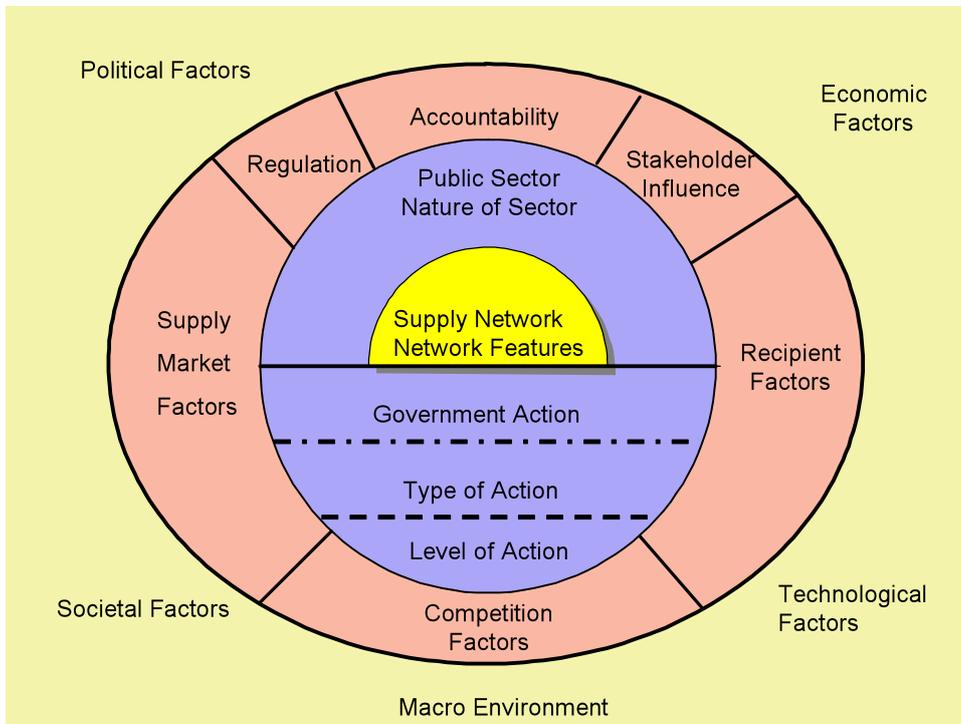
Adapted Gershon 1999

Figure 3 6 Stage Process of IT assimilation



Adapted Nolan, R.L., (1979)

Figure 4 **Conceptual Model of Public Sector Supply**



Source : Harland, C., Gibbs, J., Sutton, P., (2000)

SUPPLY STRATEGIES FOR THE PUBLIC SECTOR - A CASE STUDY (WORKING PAPER)

Mr. Paul Davis⁶

Abstract

This paper is focused on the public sector supply strategy in the Republic of Ireland. There has been considerable change in practices and processes over the past 10 years with the modernisation of the public sector. Programs such as the Strategic Management Initiative, Management Information Framework and more recently the Benchmarking review have brought the processes of the sector into the public forum.

Harland's (2000) conceptual model for public sector supply, offers a framework for analysis at the top level of public procurement policy. It offers an opportunity to assess the drivers and factors that have influenced change in the public sector procurement arena. It will allow for the isolation of the technological factors. For the purpose of this research, the isolation of technological factors is critical in establishing a link between the technology and the actions taken. Harland's model was constructed for the UK public sector, and in particular, the health sector. It is worth noting at this stage that the model itself has not been tested in the Irish context.

This paper will present the initial results of a case study currently underway with a Regional Materials Management Group (RMMG). The Irish health service is in a period of transition. Recent reports on organization and financial management have demanded an even greater focus on value for money and "lean" thinking across the service. The Minister for Health and Children set up the Health Board Executive (HeBE). Its board comprises the chief executives of the seven health boards in Ireland, the Eastern Regional Health Authority and its 3 area health boards. It was established to enable joint working between Health Agencies.

The HeBE defines the role of the RMMG clearly. The Regional Materials Management Groups and in particular the Regional Materials Manager is the principal initiator / interpreter of purchasing policy and procedures in the Health Agencies in Ireland. They have responsibility for the central procurement of all goods and services for the regional authority, the development of policy and procedures, as well as Inventory Management and Systems Development. The RMMG plays a significant role in the Procurement Process for the Health Sector. A longitudinal case study is underway with the RMMG. This paper will present initial findings from the case study using Harland's conceptual model for public sector supply.

Keywords **Public Sector, Health, Procurment**

Introduction

It is estimated that in Europe the value of public procurement amounts to EUR 900 billion or 12% of Community Gross Domestic Product for the member states (Figures relates to 1995: EC, 1999). In Ireland alone, the total non-payroll spend, (excluding the commercial state bodies), for the public sector as quoted in the E-Procurement Strategy, October 2001, is approximately EUR 8.5 billion. Of this EUR 4.73 billion is spent on supplies and services with the remaining EUR 4.12 billion being allocated to Works procurement.

This huge amount of money is being spent by a large number of government institutions on a wide variety of goods, services and projects. The spend is fragmented across a wide range of sectors. The biggest sector being the Health Sector with a spend of € 1.5 billion per year on the purchase of goods and services for direct patient services.

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The E-Procurement Strategy produced by PricewaterhouseCoopers, outlined proposals for the development of e-procurement to streamline the public procurement process. O'Connor (2003) noted "...the projected cost of taking the big bang is huge. While in the longer term there may be considerable savings, the history of failed investments in technology and the prospect of a long payback period are considerable constraints to moving forward." Furthermore the major structural / organizational and technical changes proposed are sceptically looked upon by the public sector itself.

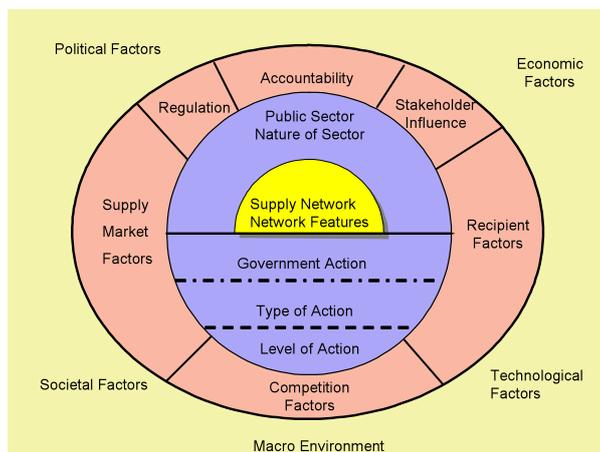
Currently the Department of Finance is leading a number of initiatives which have come from a strategy proposed internally within the department. This has led to the Department teaming up with the Health and Local Government Sectors, and with the Department of Defense, Justice, Welfare and the Office of Public Works. The strategy focuses on four key strands – building organizational capacity to maximize savings, developing people to sustain improvement, reducing costs through aggregation of demand and improving efficiency through technology. The strategy is being rolled out under the auspices of the National Public Procurement Policy Unit.

More specifically, the Health Sector is undergoing structural changes (Brennan Report, Prospectus Report) which may see the procurement processes currently in place changing. The adoption of standardized Financial and HR systems (both SAP), across the health sector are also influencing the technology changes in the procurement process.

Conceptual Model

Harland's (2000) conceptual model (Figure 3) for public sector supply, offers a framework for analysis at the top level of public procurement policy. It offers an opportunity to assess the drivers and factors that have influenced change in the public sector procurement arena. Starting from the outside in, it allows for the macro-environment to be mapped, but not in isolation, rather in relation to the sector that you are dealing with. Secondly the sector factors which include, supply factors, regulation, accountability etc. can also be mapped. Looking closer at the model, actions at the government, Sectoral and organizational level can also be drawn and shown in the overall context of the public sector. For the work here it allows for the isolation of the technological factors which for the purpose of this research the isolation of technological factors is critical in establishing a link between the technology and its impact. Although Harland's model is designed for the UK public sector, and in particular the health sector, it is worth noting at this stage that the model itself has not been tested in the Irish context.

Figure 3 Conceptual Model of Public Sector Supply



Source: Harland, C., Gibbs, J., Sutton, P., (2000)

Methodology

In order to investigate the area and to achieve the objectives and aims it was proposed to conduct the research using 3 research methodologies. They were a literature review, cross-sectional survey and an in-depth case study of three selected cases. The objectives of the literature review were to provide background, perspective and technical knowledge useful in conducting the rest of the research. This encompassed textbooks, current/past research, journals and EU/Government Publications. The objective of the questionnaire is to look at the how the process of procurement has changed due to the introduction of technology. In designing the questionnaire there are three areas people – organizational structures, process – procedural, manual and automated, and costs will need to be examined. This is ongoing and is not reported here.

The Case studies are focused and in-depth in a single area the Health Sector. The rationale for using the case study approach is that there a number of processes and interactions such as social functioning and personality in the procurement process which cannot be studied effectively except as they interact and function within the bodies/entities themselves. In the main the Case studies will take into account a number of considerations. These will in effect note that a 'clean theoretical slate' approach to case study building cannot be taken. This supports the view that Eisenhardt (1989) stated, that the research purpose, site selection, and information gathering requires some rationale, indicating at least some theoretical basis

It is proposed to take a realist approach. The framework by Perry and the approaches taken by people working in IS research is suggesting that an interpretive and more specifically a realist approach is most suited. Orlikowski and Baroudi claim that the positivist approach is not complex enough to reflect all of the inherent complexity, ambiguity and instability of organizational information systems. As Yin (1994) explains the research is exploratory, as there are some a priori theory that is used to select the case sites and the constructs to be examined. The final output is planned to be proposals developed based on the observations at the sites chosen. The operational constructs proposed will be redefined and developed further. It is hoped that the use of multiple sites may be maximally different to highlight the commonalities and differences in the observed phenomena.

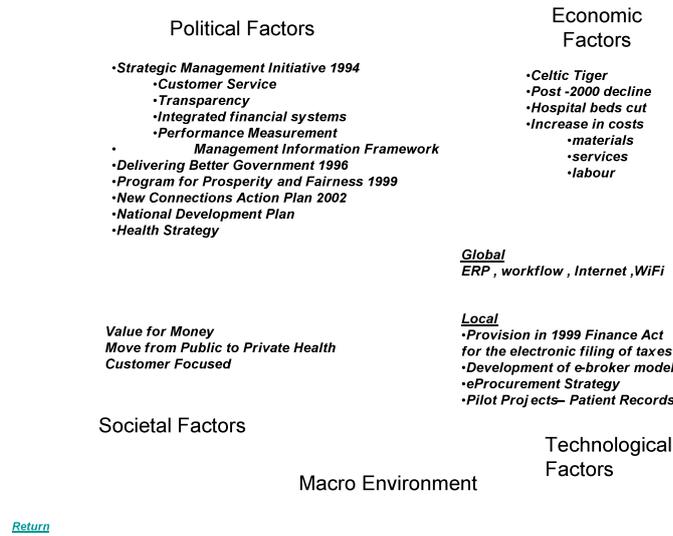
Findings

An initial overview has been taken of the Irish Public Sector and some of the key drivers (Fig. 4). Key drivers of change across the sector have been the focus on customer service, e-government value for money. Economically over the past 12 years Ireland has gone through an economic boom which has contributed to increased spending in the Public Sector. Furthermore the ongoing development of technologies has forced all levels of the public sector to review both their internal and external facing requirements.

The Irish Health sector itself has undergone major changes. In the area of procurement itself, this has been through the development of the Regional Materials Management structure, the introduction of the Health Board Executive, which has led to a concise Procurement Strategy being published for the sector in 2003.

The Irish health service is in a major period of transition at this moment. Recent reports on organization and financial management have demanded an even greater focus on value for money and "lean" thinking across the service. The Commission on Financial Management and Control Systems in the Health Service recommended that 'there needs to be an accelerated program of investment in information systems to extend SAP and PPARS to all major spending agencies' (January'03). Furthermore they make as a key recommendation that a number of agencies in the Health system should be consolidated, they state that 'there is scope for delivering many of the support services (payroll, accounting, information technology, systems development, procurement etc) through a single shared services unit within the system or outsourced by way of public/private partnership.'

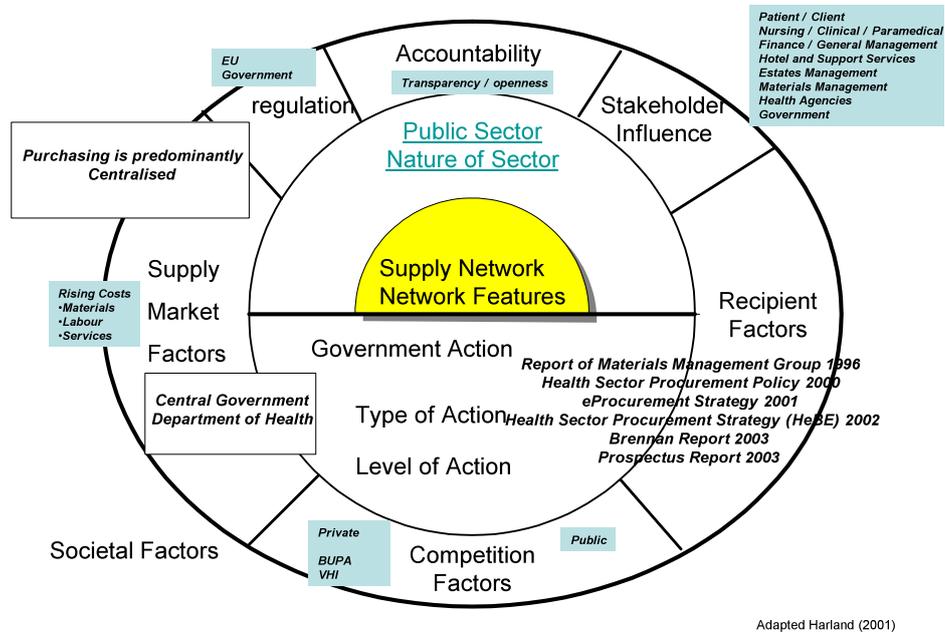
Figure 4 STEP Analysis of Irish Public Sector



Source Author 2004

In reviewing the sector, it was found to be fragmented and diverse. It was seen from both interviews and documentation that the sector procures through a large number of agencies including the Health Boards, The Healthcare Materials Management Board, Hospital Procurement Services Group, 29 Public Voluntary Hospitals, the Department of Health, the Regional Materials Management Groups and the Health Board Executive (see Figure 5). Therefore the organizational changes required are extensive to achieve efficiency and effectiveness in the processes.

Figure 5 Overview of Irish Health Sector



Source: Author (2004)

The structures are further complicated by the fact that the Health Board Executive (HeBE) was set up by the Minister for Health and Children and as such was established to enable joint

working between Health Agencies. Therefore the proposals would mean changing both structures and legislation. This is now in-train and the Health Services Executive is proposed to be in place from January 2005.

Initial data has revealed that there are up to 35 different systems in place throughout the Health Sector managing both the procurement process and financials. It has only recently been decided (2004) to implement a standard financial management system. This has direct implications for the procurement process as the two are highly interlinked. Further investigation has revealed that although an agreement has been reached on coding for the procured goods, a standardized system has to be developed, and this is the subject of an ongoing project within the HeBE.

The financial system chosen by the boards for implementation throughout the service is SAP. It was identified by the strategic procurement report that the implementation of SAP in the Midland Health Board has brought about improvements and changes within the current organizational culture and structure. The following table (Table 3) illustrates some examples as seen from a financial perspective.

Table 3 Financial Performance pre and post SAP Implementation

Financial Performance prior to SAP	1998 AFS
Cumulative Deficit	(1.2m)
Stock Value	3.3m
Stock held as a %of Expenditure	2.1%
Financial Performance since SAP	2001 (draft) AFS
Cumulative surplus	0.7m
Stock Value	3.9m
Stock held as a %of Expenditure	1.3 % - improved utilization of working capital

Furthermore it was found that the Board had been able to exploit other business process improvements which include

- Electronic Fund Transfer Payments instead of manual cheques
- Consignment Stock and reduced investment in working capital
- E-procurement and automated stock replenishment
- Reductions in store locations
- Automated purchase to pay process
- Control and approval at point of order

Within each Board, except for the Eastern Health Region, where there is a shared services centre, the Regional Materials Management Groups and in particular the Regional Materials Manager is the principal initiator / interpreter of purchasing policy and procedures. They have responsibility for the central procurement of all goods and services for the regional authority, the development of policy and procedures, as well as Inventory Management and Systems Development. The HeBE describes the process of procurement in their strategy document. Thus it has been concluded that the RMMG plays a significant role in the Procurement Process for the Health Sector.

Conclusions

The public sector in Ireland is quite complex. It accounts for an annual spend of in excess of €8 billion per year. In the Health Sector alone this is greater than €1.5 billion per year on goods and services. Any analysis of the sector must first look at the Sectoral context. In order to do this Harland's conceptual model for supply networks is used to establish the context and actions that are being taken, initially at an overall public sector level and then more specifically focusing on the Health Service. Initial work reveals a service in transition, with a large array of systems in place. It also reveals that progress on the procurement at a strategic level is at an advanced stage of planning. In order to investigate the impact of technology on the procurement process it is planned to focus in on the process itself as a unit of analysis. For this to happen further analysis at the level of a number of case studies are planned. An initial study with a Regional

Materials Management Group (RMMG) of a Health Board is currently underway. This is being designed as a longitudinal case studying order to capture the changes that are happening both from a technological perspective but also from a Sectoral perspective. It is planned to use this initial case study as an exploratory study in the Health Sector and to carry out further case studies across the sector.

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SUPPLY-CHAIN MODELLING: A COMPARATIVE CASE STUDY OF A PRIVATE SECTOR AND PUBLIC SECTOR APPLICATION

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Abstract:

The application of modelling methodologies to the analysis of complex supply networks is becoming more prevalent in industry. The reasons for this are both simple and complex at the same time. The benefits of modelling are seen by organizations not only to be related to the capability for improvement and optimisation, but also often just the capability to develop deeper understanding or insights about the system from simply undertaking the modelling exercise in the first instance. A model can also help in the decision making process. Due to its complexity and the involvement of different organisations the overall performance of a supply chain is often not very obvious. Changing one parameter might have severe influences at a completely different position in the chain. Traditionally modelling has been used in manufacturing organisations, but in more recent times modelling is being applied to a wider selection of organisations including non-traditional sectors such as public health care. This paper presents two contrasting case studies one in the semi-conductor industry and one in public health care applying modelling techniques, specifically discrete event simulation modelling, to the analysis and improvement of supply-chain management by the organisations involved.

Keywords: Supply-Chain Management, Discrete Event Simulation, Semi-Conductor Manufacturing, Health Sector, Service Supply

Introduction

Supply chain management (SCM) can be defined as a set of approaches utilized in order to efficiently integrate suppliers, manufacturers, warehouses and stores, so that a product is produced and distributed at the right quantities, to the right locations, and at the right time. The aim is to minimize costs while satisfying customer service requirements [1,2]. Various techniques can be used to develop models and solve complex supply chain problems. Simulation is a method which can be used to model the supply chain. It allows the modeller the freedom to alter some elements of the supply chain to experiment and evaluate the “what if” questions at a low cost compared to field experiments [1,3]. A model is a representation of a group of objects or ideas in some form other than that of the entity itself. A system is a group or collection of interrelated elements that cooperate to achieve a stated objective [4]. An advantage of the use of simulation is that both systems already in place and those yet to be implemented (such as those in the planning or design stage) may be simulated. Simulation has the unique feature of allowing time to be controlled. The system can be modelled to provide future predictions of the effects of making changes to the system, or it can be slowed down, allowing day-to-day monitoring of phenomena in the system [4].

The business context of many companies is radically changing [5]. These changes can be grouped under three headings: globalisation of trade, the information society and changing consumer patterns. With these changes it seems that new demands are being placed on organisations, in particular their supply functions and supply strategies. Supply strategy relates [6] to the 'integration of supply activities within firms, in dyadic relationships, in chains of firms and in inter-organisational networks'. To date however these strategies have been confined to mainly private sector analysis. Public sector supply strategies have not been looked at in any detail. There is considerable literature describing the strategies for managing supply [7,8,6] networks.

Growing importance of simulation as an analytical tool for supply-chain managers

Simulation modelling is a very useful tool to create, evaluate and understand modern and complex supply chains and helps in managing them in an efficient way. Because of its complex structure and the connections between several different parts or companies it is not that easy to develop a clear understanding of a supply network's overall performance, its strengths and weaknesses. Persson and Olhager define the actual links between buyer and seller among the whole supply chain as the supply chain structure [9]. This structure is defined by design and its planning and control is not included. A change in this structure always means a strategic decision and will have a long lasting effect. The growing requirements for efficient, fast and cost saving supply chains also created a need for a better understanding of their performances. Existing chains can be also investigated with the help of dynamic models. The planning and control activities for such a supply chain are very complex and both have to take place not only in an individual plant or facility, but across the whole supply chain network. The distributed character of activities in such an organisation usually causes conflicts of objectives between the single units and this might finally lead to problems in realising overall goals for the entire supply chain[10].

Simulation modelling is a suitable tool to show these conflicts, determine their causes and can help in discovering functional gaps (lack of data exchange etc.) or bottlenecks in the material flow. Furthermore it is a method, which allows the planner to get an idea of the influence of unpredictable events, disruptions and changes in the system for the overall output and performance of the system [11]. Taking all this together, it means that it is a highly complex task to model a supply chain in an appropriate way. To achieve reliable output data, the input data must be of equal quality as the required output. It has to be mentioned that the use of modelling techniques also requires a high data quantity [11]. Following Shakiro, the output quality is highly dependent on the input quality. But he also points out that in several cases, when sufficient input data is not available, or getting the data would mean an inadequate effort, using approximate data and assumptions is an effective way to evaluate several parameters of the system [11]. Simulation of a supply chain requires a big effort, huge amounts of data and the modelling of a complex interactive system. On the other hand, simulation models should be easy to understand. Implementations and changes should be easily accomplished to allow rapid assessment of current systems and hence opportunities to increase efficiency and quality [12]. The goal is nevertheless always the same: to optimize the management of the entire chain and that is achieved not via the sum of individual efficiency maximums, but by the maximising of the whole system in which there is a balanced distribution of the optimums and risks between all system elements [13].

Measuring the performance of a supply-chain

It is important to find appropriate performance measures to determine if all the effort in designing a supply chain finally leads to overall success or not. In most cases it is not suitable for a company to just improve function-specific or company-specific performance measures. Focusing on just one side can lead to a dramatically negative effect for the overall supply chain. To ensure an efficient supply chain it is necessary to choose performance measures that control and improve the entire supply chain and not just parts of it. Hausmann [17]] points out the importance of paying attention to different dimensions in setting up the performance measures for supply chains. He gives three dimensions, which should be treated equally. Each supply chain should at least have one performance measure per dimension to report and control it. The three dimensions are speed, service and assets. Hausmann [17]] identified a fourth dimension which is quality, but regards it as natural and automatically given in modern industry.

The service metrics will measure how well a supply chain serves its customers, using performance measures such as stock fill rate (for build-to-stock-products), percentage on-time delivery, lead time or number of back orders. The speed metrics is connected to the speed, ability to respond and the flexibility of the supply chain. Adequate performance measures could be the total time of a product in the supply chain (throughput time), the response time to customers orders or the time necessary from buying the raw material or to getting paid by the customer for the finished product. The assets metrics describes the inventory involvement in the chain. Appropriate measures would be the WIP (work-in-process), the value of the inventory or the inventory changes.

The nature of health supply chains

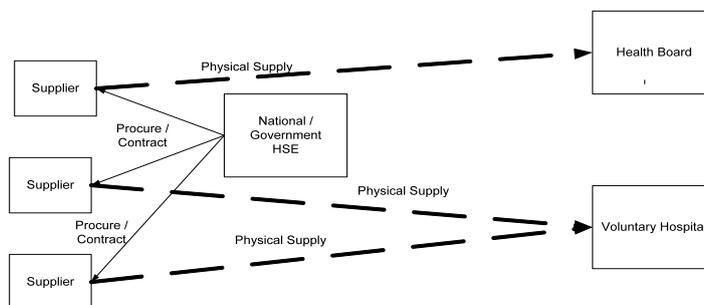
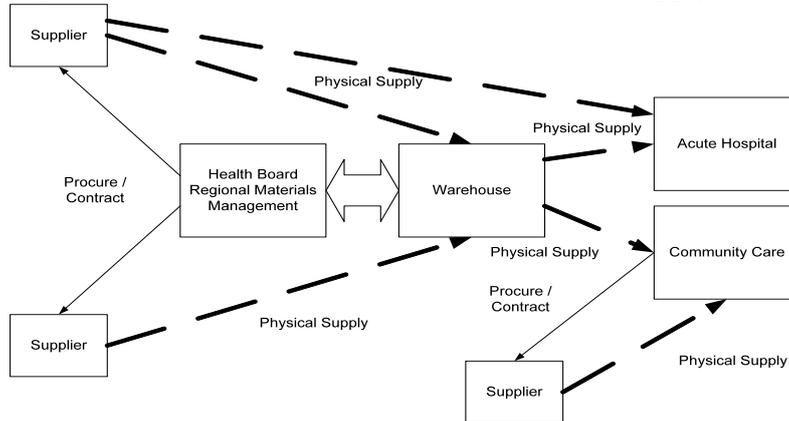


Figure 1 National Procurement / Supply Network

Two examples are given below of simplified supply networks for a number of different configurations that exist within the Irish Health Sector. Figure 1 illustrates the case of national procurement contracts. Examples given in the cases included vaccines and baby milk. A single agency would procure and contract with the suppliers, but the physical supply would be to the individual agencies. The supplier may have to deliver to many locations, which may include a central warehouse for an individual health board, or it may to individual hospitals. These physical distribution chains spanned the entire 26 counties of Ireland. Figure 2 illustrates the case of the individual Health Boards or rather the Regional Materials Management groups who contract and manage the contracts on behalf of budget holders. The example shown was one simplified map

of computer supplies. The Health Board had established a centralised warehouse where goods were delivered, but community care also purchased directly from local suppliers. The Materials Management group distributed to the local agencies, the example shown is an acute hospital, but they would also have included health centres as well. Again, similar to the previous case these distribution chains may be spread over a wide geographic area.

Figure 2 Health Board / RMMG Procurement / Supply Network



The two supply networks shown are representative of the large number of networks that currently exist within the health sector at present. In mapping them out it was observed that there are a number of different supply networks in place for similar products throughout the service, these would include computer supplies and general supplies. Current research suggests that these networks are not being viewed as common networks, and that although there is work towards shared systems, and processes there is little evidence that shared supply networks are being examined.

The nature of semi-conductor fabrication supply-chains

The general supply chain for semiconductor manufacturers can be represented by Figure 3 below. The raw materials, which are mainly silicon and chemical substances are delivered to the fabrication facilities (FAB). In the FAB the actual process of manufacturing the chip, memory devices or other semiconductor products takes place. The final product of a FAB is called a wafer. In microelectronics, a wafer is a thin slice of semi-conducting material, such as a silicon crystal, upon which microcircuits are constructed by doping (can be diffusion or ion implantation), etching or deposition of various materials and chemicals. The supply chain is slightly different from product to product. The Test and Assembly process for example might include a stacking or assembling process, but not all devices are sold this way. Some are just sold as discrete products. Some products are sold directly to the customer and some are stored in a cross-dock facility.

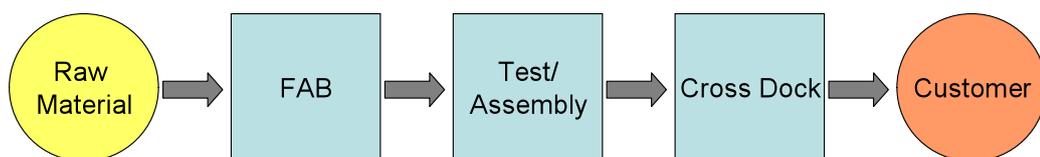


Figure 3: Schematic of a typical supply chain in the semiconductor industry

Model Development

A seven step approach to conducting a simulation study has been suggested [18]. Using a structured approach to developing a model is essential to ensure that validity of the model. The seven step approach is shown in Fig. 4. The seven step approach allows the validity of the model to be examined throughout the model development which is critical to the success of a simulation project. It is also of great importance that an accurate assumptions document be created and relevant data gathered before the model is constructed. This will aid the validation and credibility of the simulation model.

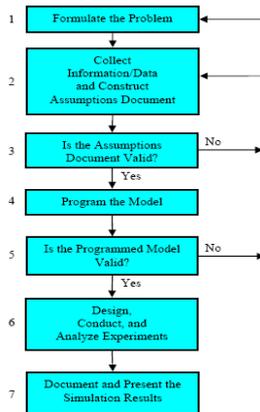


Figure 4: The seven step approach to carrying out a simulation study [9].

Discussion

Supply chain management (SCM) is an effective and vital tool in today's global market for delivering products and services in a time efficient manner. The high cost of distribution and logistics is of great concern in many sectors, such as healthcare. Cutting the costs of these tasks will allow patients to benefit from the savings made. Some of the critical factors in SCM include demand management, customer relationship management and supplier relationship management. At present a kanban system is used to control the stock levels of some of the products. This has yet to be implemented for others. The Kanban system uses two bins which each hold a specific number of a product, such as surgical gloves. When the stock from the first bin is completely used, the second bin is opened. An order is then placed for another bin of the stock. The order is received at the warehouse of the Health Executive and is met, assuming that the product is immediately available. An investigation is required to determine the optimum size of the bins, as it is the bin size which will determine when an order for new stock is placed. When the stock level of a product in the system passes below a particular level, as dictated by the bin size, an order is passed to the warehouse. The information transfer is denoted by the dashed arrow. The order is then dispatched to the hospital. The surgical gloves are a high usage, low value item. There will be frequent orders and deliveries. One in modelling the hospital supply chain was that some products, such as surgical gloves, have more than one customer, as they are distributed to many wards. The simulation model was required to model this as some customers will provide more demand than others. Therefore, different bin sizes may be required at some locations if analysis of the model finds this to be beneficial.

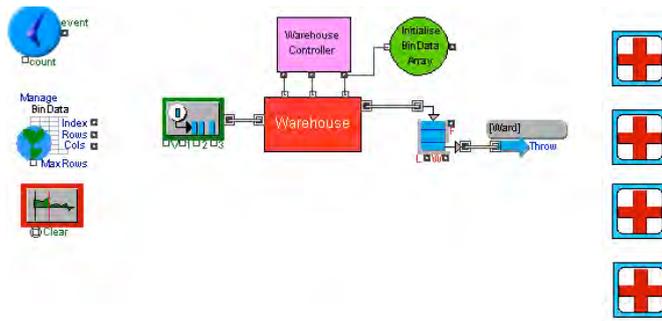


Figure 5: The basic Extend model showing the warehouse and hospital. The multiple customers, wards, are denoted by the hospital cross symbols.

Within the warehouse and wards, additional blocks were used to simulate the demand and the kanban systems. Validation of the model was a crucial step, as discussed previously. In order to be able to make decisions about potential changes to the real world system, the model first had to be validated. This process continued throughout the duration of the project. The results produced from runs of the simulation model using probability functions, drawn from the historical data, were closely monitored so that they could be compared to the performance of the real system. When the simulation is run there will be a period of time required to be removed to undo the bias of the initial empty system. This is known as the warm-up period and data will not be taken from the model until this period has ended.

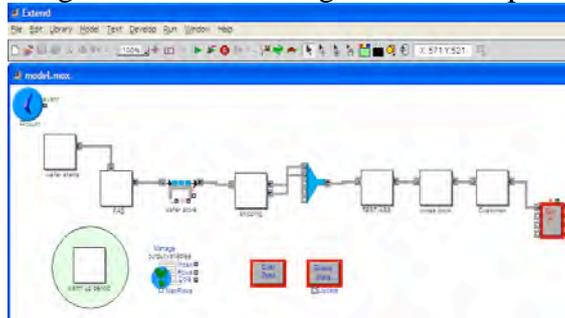
Model Development and Assumptions for Semi – Conductor Industry

In order to simplify the modelling exercise, we selected a single product for analysis, in consultation with supply-chain managers and planners. The actual supply chain for the chosen product is basically the one shown in 3. One difference for this product is that there is a so called “Sort-process” after the actual production of the wafer in the FAB. In this process bad wafers are sorted out to ensure that only good ones are shipped to the test and assembly facilities. The shipping itself is also a speciality in this supply chain. If the customer demand changes or if production in the FAB is delayed, it might become necessary to ship the wafers in express shipping instead of using the usual channels. These expedited shipments save time but of course increase costs. It is executed by plane while the normal shipping happens by ship. Another difference to the general supply chain is that for this product there are two buffers for products.

Model assumptions

In order to build the simulation model there were some assumptions which had to be made which are summarised in this section. Some of them were necessary due to lack of real data and some were made to keep the model easy and clear. The first assumption was that the necessary raw material for the production of the wafers is always available in sufficient quantity and quality. This means that the suppliers are not restricting the system in any case. Therefore, the model assumes that whenever a wafer is to be started, the necessary raw material is already there. The second assumption is that there is an “unlimited capacity” in the FAB and the Test and Assembly facilities for this product. Given that the average capacity required for the product considered is only approximately 13.5 % of the total available capacity per week for its product family, the assumption of unlimited capacity in the FAB is justifiable. Some assumptions were

necessary at the customer's end of the supply chain in order to simplify the modelling process. Unlike the real system the modelled supply chain only has one customer that creates a demand for the product. In reality there are of course several different customers, but to keep the model as simple as possible it is assumed that all the manufactured items are sold to one customer. The final decision on how many wafers will be started is then a mixture of experience, reaction to demand forecasts and special circumstances (. The model was developed using the simulation software Extend from Imagine That Inc and Figures 6 below provides a screen shot from the model.



Conclusions

The importance of supply chain management strategies and performance measures related to costs, customer service and therefore a company's success on the market has become more and more apparent in recent years. Supply chain management is an overall approach including not only the processes in-house, but also including suppliers, retailers and distributors. Simulation modelling and modern software packages offer the possibility to do so and researching the literature delivers a lot of indications of how to apply supply chain modelling for a companies benefit. The work reported in this paper can be seen as a starting point for comparative models of supply chain practice. The models developed contain a lot of simplifying assumptions; but they are nevertheless valid models and delivered some possibilities for experiments. Both sets of models though are built from the same principles and as such best practices that are implemented in one industry can easily transferred to another. Although supply chains are complex in both, there exists the possibility of through the use of simulation the development of overlapping models that supports the roll out of these best practices. It is hope that the development of this research will lead to further overlap of simulation of supply chain from traditional manufacturing to service based industries.

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Appendix 7 Sample Process Maps

Procurement process

Review Process
- strategic /
operational
Budget Process

What is that is
wanted?

The concepting stage of procurement e.g. if one were looking at a new payroll system, does one want just a payroll system? A payroll and personnel system? An outsourced payroll function (including systems) etc.? Consultation is vital at this stage.

What can the
market provide?

Whilst thinking about what one actually wants to procure, one should also build up an understanding of the market(s) one intends to procure from. One should engage with the market(s) to find out what suppliers can and cannot provide, how they may add value, bring new innovations and how one can gain leverage etc.

Tender
Design

How should the
procurement of
what is wanted be
processed?

Having identified what one wants to procure and that the market(s) can provide it, one now needs to decide how to make the purchase e.g. open tender, restricted, negotiated, with a strategic partner etc. One may also need to consider the size of the package of work an organisation offers. Too small a package may discourage suppliers; too big a package may discourage local suppliers etc.

Tender
&
Evaluation
Process

Making the
purchase

The actual mechanics of making the purchase e.g. placing adverts, shortlisting, invitations to tender, evaluation, contract award and payment etc.

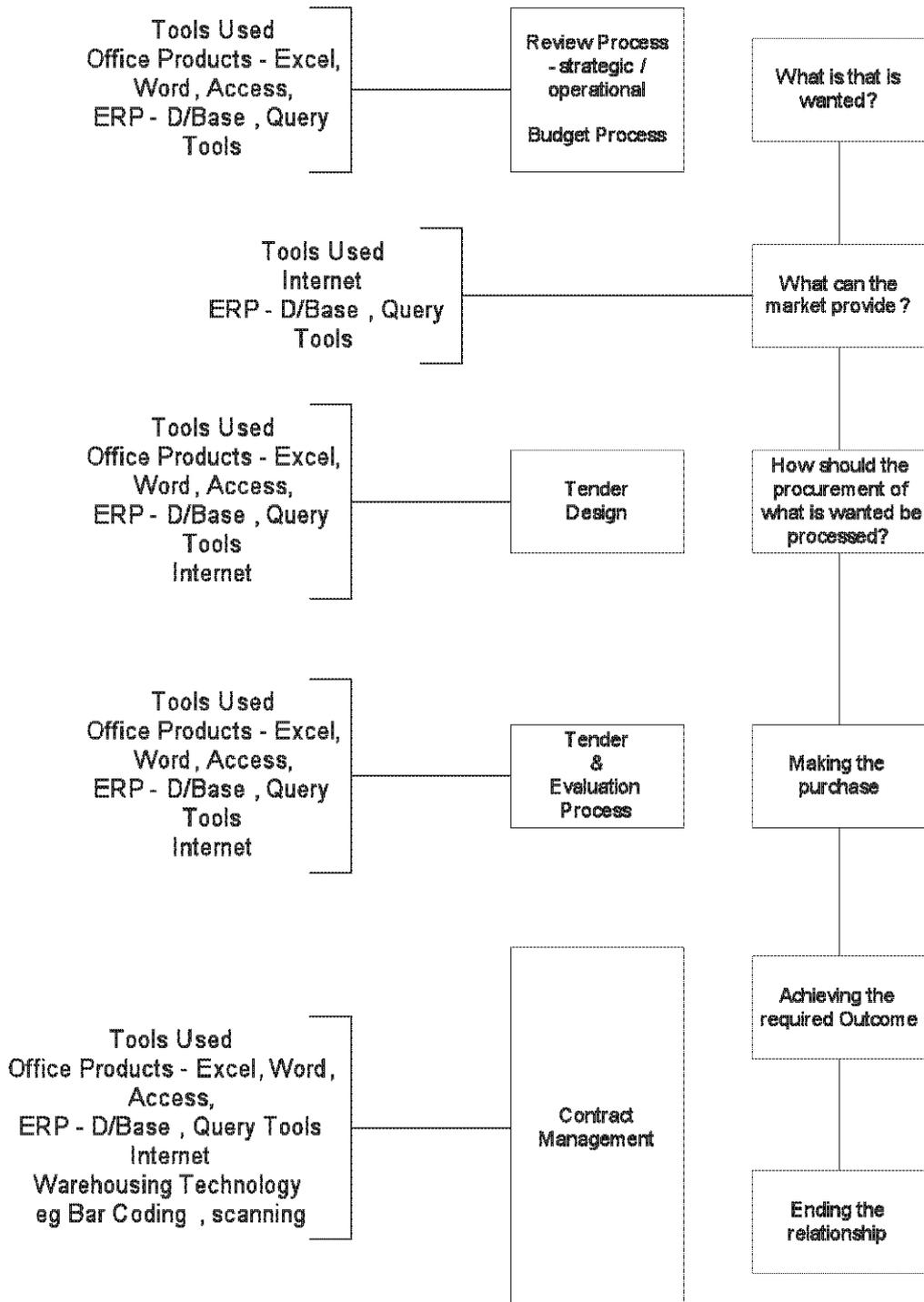
Contract
Management

Achieving the
required Outcome

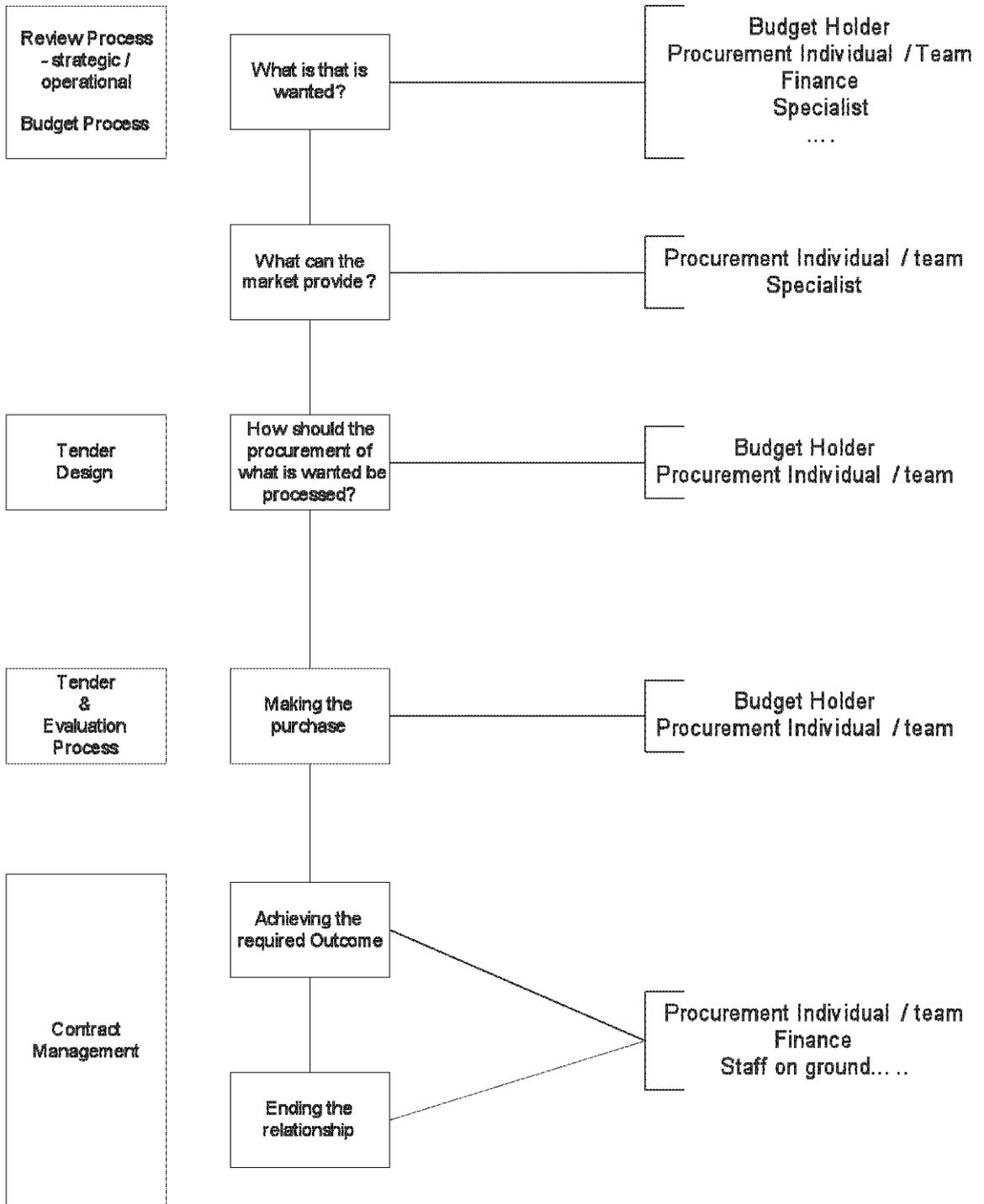
Contract management. Having set up the contract, procurement officers have a key role in working with the suppliers and budget holder to ensure the contract delivers what was intended.

Ending the
relationship

Procurement process

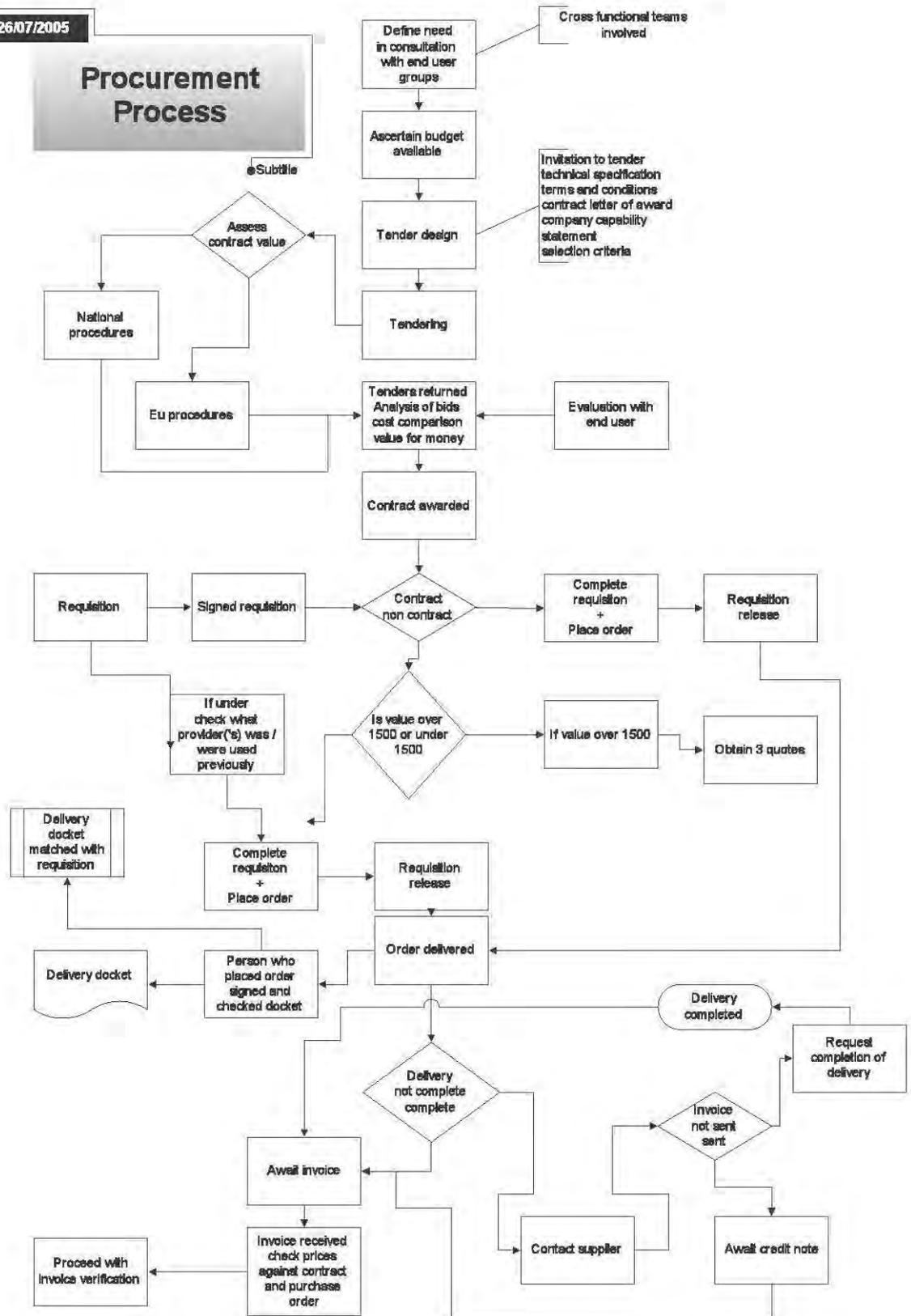


Procurement process



26/07/2005

Procurement Process



Appendix 8 List of Publications

Conference Papers

- 'The Impact of Technology on Public Procurement', Paper / Presentation, Irish Academy of Management, 2-3rd September, 2003
- 'The Impact of Technology on People, Process and Cost – a study in Public Procurement', IPSEERA Conference 2004, (Conference Bursary winner from IPSEERA)
- "Studies in Public Procurement - The Impact of Information Technology", UCC Doctoral Colloquium, April 2004
- 'The Impact of Technology on People, Process and Cost – a study in public procurement', Irish Academy of Management, Doctoral Program, September 2004
- Supply Strategies for the Public Sector, Logistics Research Network, September 2004
- Supply Strategies for the Public Sector, A Case Study, IPSEERA, March 2005
- Public VS Private, Structures and Operations a study of differences in Procurement, IAM, September 2005
- SUPPLY-CHAIN MODELLING: A COMPARATIVE CASE STUDY OF A PRIVATE SECTOR AND PUBLIC SECTOR APPLICATION, Hsiao-Hui, Chung, Georg Windln, Paul Davis and John Geraghty, International Manufacturing Conference, Waterford Institute of Technology, September 2007
- SUPPLY-CHAIN MODELLING IN THE SEMI-CONDUCTOR INDUSTRY: A CASE STUDY, Georg Windln, Paul Davis and John Geraghty, Sixth Conference on the Analysis of Manufacturing Systems, Lunteren, The Netherlands, 11-16 May 2007

- **Other Publications**
- "Competing for Government Tenders" Irish Engineers Journal, Vol.58, December 2004
- 'The Procurement Process – An opportunity for research', Irish Health Care Management Association Yearbook, December 2006

- 'Education for Procurement Professionals', Irish Health Care Management Association Yearbook, December 2006
- Public Private Partnerships, HSE Procurement News, September 2007