

Authors:

Helena Edrén 21372

Malin Sundin 21395

Stockholm School of Economics

Department of Marketing and Strategy

Buying Processes within Hospitals in Sweden

- A case study on procurement of technically complex products

Abstract: When public organizations in Sweden conduct purchasing, they are obliged by regulations to conduct public procurement, why the regulations have a clear effect on their buying behavior. For hospitals, that all are subject to these laws, purchasing the right product is further of utmost importance due to the clear impact it has on patient safety, which must be guaranteed. Today there is no extensive mapping of the purchase behavior at hospitals, especially regarding technically complex products. This thesis aims to obtain an understanding of buying behavior for technically complex products at hospitals in Sweden, and provide managerial implications, through studying the purchase process, the people involved and the purchase criteria they use. The research is conducted through a case study of three Swedish hospitals, together with theory and literature studies. We develop a general buying model for the studied cases and conclude that the purchase process for hospitals is extensive, includes many people and professions, and that the criteria used by each profession to evaluate offers have a clear link to the factors their individual performance in turn is evaluated on. We further find that purchasers mainly focus on administrative aspects and clinicians on user aspects, while technicians function as a linking interface between those two professions. Moreover, clinicians are found to be crucial to the process due to their role as final users of the products.

Course 629, Bachelor Thesis in Marketing**Spring 2011****Tutor:** Per Andersson**Examiner:** Patric Andersson**Key search words:** Procurement, Hospital, Medical Devices, Buying Process, Decision-Making Unit

THANKS TO...

Per Andersson for valuable insights and priceless support

Ortivus AB for inspiration and a useful and appreciated introduction to the area

Björn Axelsson for sharing his views on public purchasing

Arash Alidoost and **Max Odéen** for endless support and putting up with all our fuss

and

All **interviewees** at participating hospitals for making this thesis possible

∞

”There are three categories of people in industry –
the few who make things happen,
the many who watch things happen
and the overwhelming majority who have
no idea what happened.”

- **O. A. Battista**

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1. Introduction

1.1 Problem

“You cannot close a deal without thoroughly completing all the steps in the purchase process and specify [the purchase criteria] without being able to alter them later on, and thereby you have to live with the results of your specifications.”

– Axelsson (Mar 2011), when discussing the purchase process within the public health care.

“You have to be a large group to complement each other, a purchaser won’t come to think of aspects I consider important, and as a clinician, I cannot keep track of every aspect of LOU.”

– Clinician A (Apr 2011), when elaborating on people involved in the purchase process.

“As a result of the many professions involved, many different points of view have to be considered [...] and it creates room for discussions where purchasers may have a hard time arguing against clinicians who refer to patient safety as a reason for wanting equipment from a certain brand.”

– Purchaser B (Mar 2011), when discussing procurement of technically complex products.

The above quotes illustrate the complex picture that emerges when studying purchasing conducted within public healthcare organizations, as this thesis does in general. However, in particular it examines the procurement of technologically complex medical devices.

When studying the complexity of healthcare buying in a larger context, two major perspectives are clear; (1) Swedish welfare in general, and healthcare in particular, are frequently discussed topics, shown in the various debate articles that can be found on the subject (e.g. Alliansen i Stockolms län 2011 and Andersson 2011) and the Swedish government’s continuous ordering of reports covering the healthcare industry (Nutek 2011). A reason for this interest might partially be the healthcare sector expenditures reaching the amount of 8,4 per cent of the Swedish GDP during 2007 (Government Offices of Sweden 2007). These expenditures partly relate to the purchasing of hospital equipment, which leads us into the other perspective; (2) business-to-business (B2B) purchasing that in general is a very complex matter, as far more aspects have to be taken into account compared to in private purchasing (Kotler and Armstrong 2010).

Public purchasing can be said to be even more complex than other B2B purchasing as it is extensively regulated, both on international and national levels (Swedish Competition Authority 2011a). The large impact of the regulations on the purchase process of healthcare organizations is distinct, as noticed by Axelsson (Mar 2011) when talking about the purchase process of public

healthcare organizations: “One has been very focused on always acting in accordance with the law and not make any mistakes, since it may result in fines and suchlike.”

Despite the extensive regulations on the area, it is still possible for external actors to influence the purchase process and criteria used (OECD 2007). The major reason for this is that despite regulations and that the buying is conducted by organizations, it is in the end *individuals* who make the purchases (Kotler and Armstrong 2010 and Thai 2001) and many criteria used are subject to personal interpretation affecting the purchase decision (Jobber 2007), as illustrated by Jönsson (p. 10 2007): “Quality can have a different meaning for different actors and in different contexts.” Moreover, the regulation of public procurement does not – which seems to be the general perception – only focus on purchase price as a determining criterion for purchasing decisions, which further facilitates for individual and organizational interpretation (Swedish Competition Authority 2011b). This illustrates how complex purchasing within public organizations is and why it is interesting as a subject of study.

However, regarding Swedish hospitals there has not been any extensive mapping of how the decision process is carried out, which individuals are participating and what criteria they use for making purchase decisions – knowledge that can be of great value for suppliers to the healthcare sector. We reflect upon the fact that people might rely too heavily on regulations and therefore expect the purchase processes to be identical within all healthcare organizations, which might not be the case.

Vaalamäki (2009) and Hutt and Speh (2010) discuss how to effectively influence the people involved in the purchase process, and conclude that the supplier has to study what people are in charge of making the purchase and try to influence the criteria set by them. For suppliers in the medical device industry, having knowledge about the complete purchasing process and the people involved is thereby of great value to be able to successfully promote offerings, as confirmed by Ortivus AB (Feb 2011). Yet, it can be a challenge to identify the process, the participating people and the criteria they use (Vaalamäki 2009), which we hope that this thesis will contribute to with its findings.

1.2 Purpose and Research Questions

As stated in the introduction, there is a value in mapping the buying behavior of both public organizations in general, and hospitals in particular, why the purpose of this thesis is to, through a case study: *to describe and analyze the decision-making process for purchasing technically complex medical devices at hospitals in Sweden*. Investigating the decision-making process refers to mapping the steps in the purchase process, the individuals that are participating and their influence on the purchase as well as purchase criteria used through theory and literature studies along with several in-depth interviews at

three different hospitals. In accordance with the above stated purpose, the research questions of this thesis are:

- *How is purchasing of technically complex medical devices conducted within hospitals in Sweden in terms of the buying process?*
- *Which types of professions are involved in the purchase process for technically complex medical devices and in what way do they have impact?*
- *What are the major purchase criteria used to evaluate tenders of technically complex medical devices?*

1.3 Delimitations

Certain delimitations were necessary to be able to conduct this study. Firstly, we only examine the public procurement within the healthcare sector in the Swedish market to delimit the study to one specific industry. Secondly and more specifically, we study the procurement of patient monitors (see Appendix 1) by hospitals due to two reasons: (1) the idea of the thesis originally came from Ortivus AB, a company providing medical devices to hospitals in Sweden, interested in learning more about the market and (2) it delimits the study to one specific purchase situation, which is reasonable as the regulations regarding public procurement differ depending on the value of the purchase. The estimated value of the procurements we study is above the threshold value of 193.000 euro, which makes the rules of *open*, *restricted* and *negotiated procedures* (see Appendix 1) applicable (Fryksdahl and de Jounge 2011). Finally, we have restricted the scope to include three specific hospitals in Sweden, a necessary limitation given the thorough depth that we strive to achieve with this thesis.

1.4 Expected Contributions

The main expected contribution of this study is to increase and deepen the understanding of the purchase behavior of hospitals in Sweden buying technically complex products in a more complete way, by thoroughly mapping the process, people involved and criteria used. Few academic studies have been conducted on the Swedish market for hospital procurement of technically complex products, and this gap provides possibilities to add to current knowledge in the area. Further, we hope to provide suppliers of technically complex medical devices with insights and implications of the buying behavior, as legislation govern the contact between suppliers and public buying organizations during the purchase process. Thereby it can be difficult to know how, when and to whom one should market products (Karjalainen and Kemppainen 2008).

1.5 Terminology and Definitions

Concepts of frequent use in this thesis are further clarified to give the reader a better understanding of what this thesis aims to investigate, to avoid misunderstandings. The term *public procurement*, or simply *procurement*, will be used in the thesis referring to the actions taken by a contracting authority

to assign a contract with a supplier for goods or services, as defined by Fryksdahl and de Jounge (2011), and they also define *tendering* as a formal offer to supply goods or services for an agreed price. Throughout the study, the terms *buying process*, *purchase process* and *buying decision process (BDP)* will be used for explaining the same phenomena (see Appendix 1), and the same applies to *decision-making unit (DMU)* and *buying center* (see Appendix 1). Patient monitoring devices are part of the medical technology industry of which a definition can be found, together with a glossary, in Appendix I.

1.6 Disposition

Henceforth, the study is structured as follows: chapter two presents the theory applied, chapter three summarizes the literature review, chapter four describes the method used, chapter five presents the gathered results, chapter six illustrates our analysis and chapter seven present our conclusions and strategic implications together with suggestions for further research.

2. Theory

2.1 Buying theory within business-to-business marketing

The first studies on B2B buying, only of limited relevance today, appeared in the 1940s (Vaalamäki 2009). However, during the 1970's, industrial buying became an emerging topic whereby Webster and Wind developed one of the earliest models of organizational buying, where purchasing is viewed in a transactional way (Lian 2003 and Mattson 1988), similar to older models. However, it complements earlier models, found to be too focused on only rational or only relational factors, and is an attempt to incorporate elements of both into one (Webster and Wind 1972).

The following theory presented will briefly describe Webster and Winds' (1972) model and thereafter illustrate more thorough theory on the three variables earlier presented – the buying process, the people in the DMU as well as purchase criteria.

2.1.1 A General Model

Webster and Wind's (1972) model for understanding organizational buying behavior describes the purchase through the following aspects, as presented by Laczniak (1979):

1. *The buying decision process (BDP)* – refers to how buyers move through identifiable stages when deciding upon a purchase, from the identification of a need until selection of suppliers (see further section 3.1.2).
2. *The buying situation* – a measure of perceived difficulty of the purchase, depending on how new the product is to the organization, the number of suppliers considered and the amount of information needed to make a decision.
3. *The buying center (DMU)* – includes all involved members of an organization and their roles in

the buying decision process. The members are motivated by a complex mix of personal and organizational objectives, where personal influences affect members' interpersonal relations whereas the formal organization influences through systems, structure and formal tasks (see further section 3.1.3).

4. *The buying environment* – any environmental, organizational or interpersonal characteristics that influence the purchase situation. Environmental factors relate to economic, legal, cultural or physical factors that are exerted through institutions such as trade unions, political parties and businesses. Organizational factors are directed by the organization's goals and constrained by financial, technological and human resources.

Purchasing is thus a process affected by individual, organizational, social and environmental characteristics, both leading to and following a decision (Mattson 1988), and this general model can be seen as the framework functioning as a basis for the further theory selected.

Within the BDP there are two types of tasks – either relating directly to the buying problem, *task variables*, or beyond the buying problem, *nontask variables*, both with corresponding motives. Task variables can mainly be found in the BDP as being all the official undertakings that members of the DMU have to perform to reach a decision, as taking into account whether the organizational purpose is served; degree of centralization regarding buying authority and degree of routine at the different BDP stages. The motive for performing task variables relate to the specific purchase problem as in buying at the right price, quality and time. Nontask variables relate to personal criteria in decision-making due to *achievement motives*, related to personal advancement, and *risk-reduction motives*, related to perceived uncertainty in reactions of colleagues and outcomes of alternatives. Nontask-related motives are often more important, although there is a direct relationship between task and nontask motives, e.g. a person performs its projects with excellence (task) to receive a promotion (nontask) (Webster and Wind 1972).

Webster and Wind's buying situation, builds upon Robinson's et al (1967) introduction of *buyclass* and *buyphase* variables to predict and understand the organizational BDP. Buyclass categorizes the purchase depending on the situation's level of novelty to the firm; *new task*, *modified rebuy* and *straight rebuy*. These situations have a parallel in extensive problem solving, limited problem solving and routinized responses (Mattson 1988). In straight and modified rebuy situations, typically fewer participants are involved in the DMU, compared to when dealing with a new task, unknown to the organization's individuals (Wind and Robertson 1982). Buyphase instead defines the BDP stages from problem recognition to post-purchase feedback (Robinson et al 1967, see section 3.1.2).

2.1.2 The Buying Process

Table 1 presents general models that the majority of other marketing studies refer to when describing the BDP (e.g. Webster and Wind 1972, Baker and Hart 2008, Hutt and Speh 2010).

	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8
Webster (1965)	Problem recognition	Assignment of organizational responsibility	The search process	The choice process				
Robinson et al (1967)	Anticipation or recognition of a problem (need) and a general solution	Determination of characteristics and quantity of needed item	Description of characteristics and quantity of needed item	Search for and qualification of potential sources	Acquisition and analysis of proposals	Evaluation of proposals and selection of supplier(s)	Selection of order routine	Performance feedback and evaluation
Jobber (2007)	Recognition of a problem (need)	Determination of specification and quantity of needed item	Search for and qualification of potential sources	Acquisition and analysis of proposals	Evaluation of proposals and selection of supplier(s)	Selection of an order routine	Performance feedback and evaluation	
Kotler and Armstrong (2010)	Problem recognition	General need description	Product specification	Supplier search	Proposal solicitation	Supplier selection	Order-routine specification	Performance review

Table 1. Different models illustrating the stages in the BDP. Similar coloring indicates similarity in stages.

Webster's (1965) preliminary model breaks the industrial BDP into four stages, yet it has been extended by several authors (see Table 1). Even further developments can be found, but are almost exclusively developed through case studies and thereby industry or product-specific (see section 4.2.2). The development of general purchase models today have a stronger focus on the contact between buyer and seller, such as the buyer-seller interaction model, and earlier models, as those presented, are criticized to be too focused on the buyer side (Baker and Hart 2008). However, as this study focuses on the buyer side, they are still of interest.

The total development of the BDP models can be illustrated by a comparison between Webster's (1965) model and Jobber's (2007) model. Almost all of Webster's (1965) steps have been further specialized and divided into several (see Table 1 color coding). Two of the steps, one in each model respectively, are not present in both – Webster's (1965) *delegation of organizational responsibility* and Jobber's (2007) *performance feedback and evaluation*. Delegation of organizational responsibility describes an individual's participation in the BDP, as a function of the product's technical complexity, importance to the firm and knowledge of the individual (Webster 1965). This applies for today as well, however the concept of the DMU has been developed where this is taken into account separately, and is not seen as a stage in the BDP (Jobber 2007). Today feedback and evaluation is considered more important, why this has been included as a formal step (Jobber 2007).

In this thesis the model of Jobber (2007) will be used as reference due to that his stages seemed more relevant for hospital buying – having conducted our pilot study – in being recently developed and including the stage *evaluation of proposals*, not present in Kotler and Armstrong (2010). The stages in the BDP all have different tasks included, illustrated in Table 2.

<u>Stages</u>	Recognition of a problem (need)	Determination of specification and quantity of needed item	Search for and qualification of potential sources	Acquisition and analysis of proposals	Evaluation of proposals and selection of supplier(s)	Selection of an order routine	Performance feedback and evaluation
<u>Tasks</u>	Recognize a problem or a need - either internally within the organization or through external factors	The DMU draws up description of what is needed more specifically	Information search and market analysis to find potential suppliers	Offerings of suppliers are gathered and thoroughly analysed	Each proposal is evaluated in the light of the choice criteria that is important to each DMU member.	The details of payment and delivery are drawn up	A formal or informal evaluation of the supplier and purchased product

Table 2. A more detailed description of the BDP and corresponding tasks to each stage. Source: Jobber (2007)

Purchase processes can either exclude or include more phases than those mentioned, and the stage order can vary depending on either organizational policies or complexity and monetary value of the purchase (Kotler and Armstrong 2010). Further, previous purchase processes affect future purchases in terms of moving to a new buyclass between old and new products (Robinson et al 1967).

2.1.3 The Buying Center and the Roles of Purchasing

Webster and Wind (1972), identify three variables in their general model of people involved in the BDP that need to be mapped to understand organizational purchasing; (1) the roles in the DMU (2) the interpersonal interaction between people in the DMU and between DMU-persons and external parties, and (3) the dimensions of the DMU as a whole. This is due to that ultimately people make the decisions and thereby companies do not buy - people do. The amount of individuals involved in organizational purchases are often many and some unknown to sellers and even if identified, the outcome of their interaction may be unpredictable (Bonoma 1982). Webster and Wind (1972) define the DMU as including five roles:

Users – members of the organization who use the purchased products/services
Buyers – those with formal responsibility and authority for contracting suppliers
Influencers – influence the decision process directly or indirectly by providing information
Deciders – have the authority to choose among alternative buying actions
Gatekeepers – control the flow of information and materials into the buying center

Later on, a sixth role has been developed: *initiators*, who recognize the need for the product or service (Bonoma 1982). The riskier a purchase is perceived – in terms of monetary value or cost of making wrong decisions – the higher the probability of finding all DMU roles represented (Jobber 2007).

The DMU concept can be difficult to apply as employees do not wear role tags, neither are they always aware of their role, since these are social roles and not explicitly individuals or a group of individuals and the DMU participants seldom call themselves a DMU. Further, the occupation of a certain role is not assignable to organizational ranks or positions (Bonoma 1982). Several individuals may occupy the same role as well as one individual may occupy several roles (Webster and Wind

1972), something that is more frequently occurring in large or complex purchases. Also, the size and structure of the DMU can vary along the BDP (Laing et al 1998).

Further roles of purchasing have been developed to capture intra-organizational dynamics between members of the DMU and inter-organizational dynamics between the DMU and outside organizations - the presence of a *linking pin* and *boundary role* (Wind and Robertson 1982). The linking pins were originally defined with only a hierarchical focus as people exerting leadership; a concept today extended to include the interface between any interrelated intra-organizational units and is thus crucial for buying situations where several independent departments are involved. The boundary role is defined as people having an inter-organizational function as in having contact with members of other organizations and thereby is the organization's agent of influence over the external environment (Wind and Robertson 1982).

Wind and Robertson (1982) developed their theory through studying hospitals buying radiology equipment and state that in a new purchase situation in professional organizations, where the purchasing department does not have a dominant role, the head of the professional group will serve as both the intra- and inter-organizational linking pin and therefore is a target member of the DMU. Their study further suggests that there are two types of linking pins; the *professional linking pin* emphasizing perceived impact on patient care and the *administrative linking pin*, giving higher utility to products' perceived impact on hospital reputation and profitability.

2.1.4 Determinants of Membership

Mattson (1988) developed a model categorizing determinants of membership in the DMU, dividing them into three areas; the firm's *environments and missions*, *purchase-specific*, and *organizational structure*. The environment and mission variables rarely affect the purchase decision directly, but rather set up the framework for the BDP through placing constraints on delegated authority; on which managerial level decisions are taken; and setting mission in why the firm is initially interested in the purchase.

Out of the purchase-specific variables, the four most important are included: how large the need is – in terms of how crucial the purchased product is for final production, – buyclass, buyphase and dollar value and complexity. The buyclass variable relating to Robinson's et al (1967) theory, suggests that as the purchase becomes more routinized, from new task to straight rebuy, the purchasing department's role in the decision should increase and management involvement decrease due to increased experience and establishment of purchase protocols. Buyphase takes into account who is most influential at each stage rather than looking at the sole decision maker. Purchasers use dollar value and complexity as criteria to determine level and intensity of management involvement, where more authority is delegated to purchasers as the relative size and complexity of the purchase

decreases (Mattson 1988). The model's organizational variables suggest studying three aspects; the actual DMU – level of management and functional areas involved, present DMU roles and their interaction, – the involvement of purchasers as well as the involvement of other departments, in terms of to what extent joint departmental decisions are made (Mattson 1988). The model does not further specify *how* to conduct the mapping itself, just that these are important variables to study.

2.1.5 Purchase Criteria

Purchase criteria refer to the factors used by the DMU to evaluate offerings, and are often determined by criteria used by external stakeholders to evaluate each individual in the buying organization (Jobber 2007), why criteria differ in importance to different members of the DMU (Hutt and Speh 2010). Much research has been conducted in this area, yet mainly for specified products or industries and not in general terms (e.g. Cohan 2003 and Kassiech and Rogers 1986). As far as the existence of general models, two complementing views will be presented, as they together provide a more complete picture of criteria categories used in B2B, further summarized in Table 3.

In *technical criteria*, quality is especially important, where buyers value consistency of quality to ensure end products' reliability and reducing inspection costs (Jobber 2007). As *economic criteria* include far more than purchase price, it closely relates to technical criteria in terms of life-cycle-cost (LCC) and continuity of supply (O'Shaughnessy 1995), the latter referring to the cost to a company a production disruption implies (Jobber 2007).

Jobber (2007)	Technical	Economic	Social/Organizational	Personal		
	Core performance of product; durability, reliability, usability, quality	Life-cycle cost (e.g. productivity savings, installation cost, maintenance cost), continuity of supply, purchase price	Status, social belongings, convention, image of company and staff, perceived risk	Perceived risk, liking and disliking (can become crucial if competing products are similar)		
O'Shaughnessy (1995)	Technical	Economic	Adaptive	Intrinsic	Legalistic	Integrative
	Core performance of product; durability, reliability, usability, quality	Life-cycle cost (e.g. productivity savings, installation cost, maintenance cost), continuity of supply, purchase price	Uncertainty in supplier capability, risk in dealing with supplier (post-service sales, guarantees, reputation)	Personal liking of styling of product and individuals from the selling organization	The need to conform to organizational policies or government laws	Closeness of selling org. to buying org; offered presales service, training and installation, follow-up services

Table 3. Summary of categories of criteria. Similar coloring indicate similarities in categories.

The implication following *social* and *personal criteria*, as named by Jobber (2007), or *intrinsic criteria*, as named by O'Shaughnessy (1995), are that the purchase decision is affected by both individuals' own relationships and social values. Jobber (2007) includes perceived risk in *social/organizational criteria*, where there can be uncertainty with respect to product or supplier performance or criticism from work colleagues, while O'Shaughnessy (1995) gives perceived risk an own category - *adaptive criteria* - and stresses its specific important in technically dynamic environments.

When evaluating offerings in organizations, economic considerations are always part of the evaluation set due to budget constraints. However, personal criteria should not be ignored as decisions are made by individuals, as mentioned previously, who do not lose their personal likes and dislikes simply because they are making a decision for an organization they are part of (Jobber 2007).

2.2 Summary

The above presented theory provides a framework that is developed over time and lays the foundation for the rest of this thesis. The founding model made by Webster and Wind (1972) becomes an overall structure for analyzing organizational buying behavior. The main takeaways are: (1) Jobber's (2007) BDP model, (2) the identification of the roles in the DMU and the linking pin role versus the boundary role, (3) the three categories of variables influence who becomes part of the DMU and in which role, reflecting external, purchase-specific and organizational aspects and (4) the categories of purchase criteria used for organizational buying. For each variable of interest to this thesis – process, people and criteria – further developments are described, yet more recent research is presented in the following section.

3. Literature Review

3.1 Previous Research

Our research has only resulted in the finding of a limited number of studies on the complete buying behavior of hospitals. This seems to be the case for other researchers as well, the issue being discussed by Vaalamäki (2009) and Lienes and Lämätäinen (2010). Hereby follows a summary of research findings with respect to the area of our thesis; buying behavior of hospitals.

Laczniak (1979) makes a qualitative study using Webster and Wind's model, analyzing procurement of monitoring equipment at hospitals in the US, where the main conclusion is that physicians are in general the most influential deciders in the DMU and most active participants in the BDP. He finds four stages in the hospital BDP: (1) the identification of need, (2) the specification of objectives, (3) the evaluation of suppliers and (4) the selection of supplier, where stages (2) and (3) are the most time-consuming. Structural variables, as organizational size and number of decision makers, do not affect the length of the purchase process. Rather, it is the amount of conflicting viewpoints among the participants that has an effect (Laczniak 1979).

Laczniak (1979) further finds that when a purchaser has the buyer role, this role is not of great significance due to lack of expertise and the medical responsibility that comes with the purchasing of medical equipment. Another finding is that most users and influencers, roles held by doctors and nurses, were involved earlier in the BDP than other professions, due to their close contact with the

origin of the need. This relates to the finding of Laing et al (1998), that administrative managerial staff take larger part in the actual start-up phase of the BDP and thereafter their participation decreases. Therefore they only play a marginal role in the shaping of a purchase decision, reflecting their lack of organizational power, and instead clinicians dominate the DMU.

Lambert et al (1997) study the criteria used by DMU's in the healthcare industry when evaluating suppliers, and find that despite governmental pressure to reduce costs among hospitals, low price has neither become a more important criterion, nor a driving force for supplier selection. Rather, product quality, delivery and service are of importance due to the extreme criticality of product quality in the healthcare sector. However, their study concerns routine order products and thereby the results may not be fully applicable to our study, as we examine purchase of technically complex equipment. Yet, as their results concern *supplier* – and not product – evaluation, a recurrent procedure for all purchases, it is of interest for our study.

Liedes and Liimatainen (2010) study the Finnish market and, similarly to this thesis, examine the complete BDP, its participants and criteria used. They find that at hospitals, the majority of the purchases are done through a purchase office, but the need recognition comes from clinicians – the users of the monitors – however, no specific person could be named initiator. The most important criteria are technical criteria such as ease-of-use and connectivity, followed by economic criteria consisting of purchase price, value for money and LCC. Since patient data is often collected into larger resource-saving systems, connectivity will be increasingly important in the future (Liedes and Liimatainen 2010).

In total, previous studies on hospital procurement identify four stages in hospital BDP's, that clinicians are more influential than purchasers, and that price is not the most crucial criteria.

3.2 Procurements within the public sector

A complex aspect of public sector purchasing is that it is to serve public interest, instead of maximize profit of the organization (Nutt 2005). Despite extensive research on both organizational buying and the influence of public procurement on purchasing respectively, limited research on the areas combined exists, as buying behavior within public organizations. Present research focuses on specific areas of a purchase, instead of the total buying behavior, or compare public to private sector purchasing (e.g. Lambert et al 1997, Tzeng et al 2007, Alsac 2007 and Karjalainen and Kemppainen 2008). Hereby follows a summary of relevant literature found.

3.2.1 The Swedish Public Procurement Act

In the EU and Sweden there is extensive regulation regarding public procurement and the Swedish law (2007:1091 - LOU) is mainly based on the EU-directive (2004/18/EG) regulating the area

(Fryksdahl and de Jounge 2011). The purpose of the regulations is to ensure free competition in markets and make contracting authorities use public funds efficiently, and LOU is therefore built upon principles regarding equal treatment of suppliers and transparency in the BDP (Jönsson 2007). Governmental authorities and state-owned companies are obliged to procure in accordance with LOU (Fryksdahl and de Jounge 2011).

3.2.2 The Buying Process Within the Public Sector

Public procurement regulations determine the stages of the procurement that public sector companies are obliged to perform (Lian and Laing 2004), making the public BDP quite predictable (Vaalamäki 2009). LOU states that a purchase starts with identification and analysis of the need, and the procurement is planned and the potential contract value is estimated and compared to threshold values that decide what part of LOU to apply. A *specifications document* (see Appendix 1) is produced containing requirements on the product and supplier, *commercial terms* (see Appendix 1) and administrative rules. The procurement's tender notice (see Appendix 1) starts and a time limit for tendering is set. Further, the buying organization rules out suppliers unable to fulfill the requirements until one supplier is chosen and awarded with the contract. Thereafter the product is delivered and a follow-up is carried out (Fryksdahl and de Jounge 2011), which ends the process according to LOU.

Organizations within a public sector with similar purposes often have similar needs (Flynn and Strehl 1996), which Vaalamäki (2009) confirms in his study on hospitals. In LOU's strive for equal competition, writing the specifications document and setting criteria is the heaviest regulated stage, as the final decision must be based on prior selected criteria. The criteria can be of two types; *mandatory requirements* that the potential supplier has to fulfill, and *preferable requirements* (see Appendix 1) considered meritorious if fulfilled. The tender documentation is to be published through certain channels, such as online tools (Swedish Competition Authority 2007). Vaalamäki (2009) thereby argues that the buying organization's information search is restricted, having to rely on information from these channels. Lian and Laing (2004) argue that transactional purchasing is retained in public organizations as a result of public sector buyers feeling accountable and thereby strictly follow guidelines and budgets. However, they state that public organizations have taken a somewhat relational stance to purchasing through adopting relational selection mechanisms such as recommendation.

3.2.3 The Buying Center Within the Public Sector

In general, public organizations have larger DMU's than private and are more likely to include administrative staff and managers, rather than professionals. Purchasing is often centralized and made by purchasers in public organizations (Flynn and Strehl 1996), to be able to capture economies of scale in prices and costs (Karjalainen 2009). However, in healthcare there is a high involvement of

professionals in the DMU, while the administrative personnel manage the purchasing protocols (Lian and Laing 2004). Further, technical complexity requires including people with technical background in the DMU (Tzeng et al 2007), often resulting in the DMU consisting of people with various expertise and responsibilities (Vaalamäki 2009), ensuring that the purchased product is in line with end user needs (Tzeng et al 2007).

3.2.4 Public Sector Choice Criteria

A main feature of public organizations is that they are obliged to decide upon purchase criteria prior to the starting the BDP, and are not allowed to alter them later on. Further, price has long been the core criterion of public procurement, yet today other factors, such as total quality and value, are gaining ground (Tzeng et al 2007). A development can be seen towards utilizing quality-based criteria, both in private and public organizations (Duncombe and Searcy 2007), although the development is slower in public organizations (Axelsson Mar 2011). Further, for many organizations, LCC has become the determining criterion instead of price and a total quality perspective with more emphasis on achieving the highest end user value is used (Farrington and Lysons 2006). Even though procurement has become more value-oriented, it still has a strong link to price (Vaalamäki 2009).

Public organizations have in general high risk averseness, where perceived risk is nearly synonymous with the importance of the purchase (Nutt 2005). Lian and Laing (2004) illustrate the particular risk-averseness of the healthcare sector as the cost of making a wrong decision is higher compared to other industries, and therefore quality of the offered product has a high impact on the purchase decision. Another implication of the risk averseness in healthcare is the perceived high value of references, and as strong professional networks exist, established suppliers often have advantage.

4. Method

4.1 Research Design

As of today, little explicit research has been conducted on how public healthcare organizations conduct purchasing in regard of describing the complete picture – the process, individuals involved and the criteria used (Vaalamäki 2009), and we have not found any similar studies conducted on the Swedish market.

Thus, to contribute to decreasing the knowledge gap and fulfill our exploratory purpose – being of investigative and descriptive nature (Merriam 1994) – we have applied a qualitative research method. As the aim of the study is to gain a deeper understanding and thoroughly map the public hospital purchasing behavior, a qualitative approach is more appropriate than a quantitative (Malhotra 2004). Further, qualitative studies provide contextual information and insights of human behavior to a

much larger extent than quantitative research (Guba and Lincoln 1994), which is of relevance for this study, since organizational buying behavior is highly influenced by both the context and participating individuals (Webster and Wind 1972).

Yin (1994) states that if three conditions are met; (1) the form of the research question is “how” or “what”, (2) the research focuses on contemporary events and (3) the researcher does not have control over behavioral events, the research should be conducted through a case study and all three conditions apply to this thesis, why we have chosen this approach. The aim of case studies is – in line with our purpose – to provide description (Eisenhardt 1989), and case studies are further argued to be a well-adapted method for understanding and interpreting observations of phenomena (Merriam 1994), and this supports our choice of conducting a qualitative case study.

To understand the buying behavior at Swedish hospitals, in-depth interviews have been used, since these can uncover greater depth of insights compared to, for example, focus groups (Malhotra 2004). In-depth interviews are mainly recommended for gaining only initial insights, yet in some specific situations they are recommended as a primary source of data, such as when interviewing professionals and aiming for a detailed understanding of complicated behavior, why it is motivated for this study (Malhotra 2004). Our approach of conducting interviews along with literature and theory review is an attempt to apply methodological triangulation through the use of multiple sources of data, increasing the potential accuracy and strength of our conclusions (Yin 1994).

4.2 Theory Selection

Even though this thesis is mainly based on in-depth interview findings, theory and literature reviews are still of importance. Foremost theory provides a solid base for analyzing the data thoroughly in accordance with the method of pattern matching suggested by Yin (1994): establishing a predicted pattern prior to empirical data collection. Due to the clear relationship to industrial purchasing our study has, applying B2B marketing and purchasing theory is a well-motivated choice.

As Wind and Nicosia (1977) states, organizational BDP is a multidimensional process and the understanding of it must not only include activities of the buying process, but also the people who perform the activities and the results of such activities. Therefore a general model of the buying behavior, created by Webster and Wind (1972) covering foremost the BDP stages, the people involved and external factors influencing the purchase, has been chosen as a foundation for theory selection. It illustrates in general terms many of the aspects necessary to cover to obtain a complete picture when studying organizational purchasing – the BDP, the people and the criteria (Hutt and Speh 2010). Studies similar to ours commonly use these three perspectives when trying to achieve an understanding of the buying situation (e.g. Lacznik 1979 and Liedes and Liimatainen 2010). Further,

Laczniak's (1979) study confirms that this macro model of buyer behavior can be used to describe and analyze organizational buying decisions and the model creates a solid basis from which more recent theory can be described. A more in-depth description of theory is applied for the specific areas of interest – the BDP, the DMU and the purchase criteria – to provide a solid basis for analysis and answering the research questions. Due to the scope of this study, some limitations have been necessary when selecting theories. Similar to the study on public sector purchasing of health services (Lian 2003), we delimit our study to examine the purchase behavior through a transactional framework, despite more recent research focusing on the role of relationships and networks in purchasing. Even though there are aspects of networks that matter in public purchasing, these are limited and heavily regulated (Axelsson Mar 2011). The implications of this on the study is that little theory regarding networks will be incorporated, however, we will be open to their existence.

4.3 Data Collection

4.3.1 Literature Review and Interviews With Experts

Information has been collected from a number of different sources, mainly academic publications, yet also from government reports and industry journals, both relating to the healthcare sector and the purchasing area. To confirm our understanding of literature and its development over time, we interviewed a marketing professor specialized in purchasing.

4.3.2 Selection of cases

Eisenhardt (1989) stresses that it is neither necessary, nor preferable to select cases randomly. Rather, as a limited number of cases can be studied, the area of interest of the selected cases should be transparently observable. However, cooperation of hospitals selected for analysis could not be secured in advance due to the scope of this study, why the selection of cases is a convenience sample (Onwuegbuzie and Leech 2007). To a large extent we were restricted by the workload of the hospitals and had to choose those who were available for interviews. This made us unable to study emergency units in particular, which was our initial idea, as we could not get key persons connected to the emergency units to participate. Out of eleven contacted hospitals, five responded, but only four had staff available for interviews. Continuous contact was held with the people at those four hospitals, which resulted in eleven interviews with hospital staff being held, which are made anonymous throughout the thesis. This thesis only analyzes three units and the fourth hospital is used as pilot study to test our interview questions.

4.3.3 In-depth interviews with employees at hospitals

After gathering basic theory, to understand the concepts of what was to be investigated, we started our in-depth interviews, that were semi-structured – the questions and their order were decided in

advance, yet we were open to questions that arose during the interviews (Merriam 1994). After pilot testing our interview questions, some were edited to enhance comprehensibility (see Appendix 2).

To achieve reliability we followed Malhotra's (2004) guidelines for interviewing: asking questions in order of appearance, using the wording as given in the questionnaire, repeating questions that were not understood and carefully probing by using expectant pauses to make interviewees provide further comments, clarify and explain their answers (Malhotra 2004). Due to the hospital interviewees' pressured schedules, nine of our interviews were telephone interviews, while two were made face-to-face. In market research the opinion has been that interviewing face-to-face is superior to using telephone, however today telephone interviews are considered more or at least as representative (Bryman and Bell 2010). Therefore, we do not believe that the usage of telephone interviews has affected the quality of gathered data. Rather, it has been enhanced as telephone interviews are easier to supervise and less biased in received answers as respondents' replies are not affected by personal characteristics of us as interviewers. Yet, we could not observe facial expressions or other body language signals, which might have provided additional dimensions to the gathered data (Bryman and Bell 2010).

When choosing whom to interview, data triangulation was applied through multiple interviews at each hospital, to ensure that information reported was fairly accurate. Similar to Lacznia's (1979) study, we interviewed persons at each unit contributing to the purchase, earlier identified in the pilot study: the purchasing unit, the medical technology unit and the buying clinic (see Appendix 3 for further description of the interviewees). To access the right people we ensured that each interviewee forward us to the next person of interest (Merriam 1994).

During the interview sessions we both participated due to two key advantages: (1) complementary insights increase the likelihood of capitalizing on insights in the data (Trost 2010) and (2) if observations of researchers converge it enhances confidence in the findings (Eisenhardt 1989). During the interviews, one researcher interviewed, while the other recorded notes, keeping a more distant and reflecting view, as recommended by Eisenhardt (1989). All interviews were, after the interviewee's approval, recorded in line with the recommendations for semi-structured interviews (Malhotra 2004 and Merriam 1994). Parallel to recording, notes were taken to slow down the pace and to register the more reflecting interviewer's instant analyses of the responses (Merriam 1994).

4.5 Quality of research

Several authors bring the concerns of reliability and validity into experimental research design and case study research (Bryman and Bell 2010, Yin 1994 and Merriam 1994).

Reliability refers to the extent the result of a study can be repeated and the exact same results can be achieved as the original study (Bryman and Bell 2010). However, this is a problematic issue in qualitative studies that involve interviews, since it is hard to obtain the same response from the same interviewee as the behavior of humans is in constant change. To assure the highest possible reliability we have independently gathered literature and theory and compared our understanding of the theories to ensure their relevance for our thesis. The interviews are standardized as far as possible, as we had a script to enable the possibility of repeating the study (Merriam 1994). Similar to Mattson (1988), we have focused on specific equipment and thereby focusing the respondents' attention on a well-defined and important purchase decision to increase the level of reliability. Despite the taken actions, since the questions are open-ended, the reliability can be lacking.

However, Guba and Lincoln (1981) argue that in qualitative studies, focus should rather be put on internal validity instead of reliability, as it is impossible to have reliability without internal validity. Validity can be broken down into three parts: internal, external and construct validity (Yin 1994).

Internal validity refers to how well the results of the study corresponds to what it is said to measure (Merriam 1994). In case studies the likelihood of false effects is extensive, as during interviews the objective version of the reality is not told, but rather the interviewees' construction of reality (Yin 1994). However, Merriam (1994) argues that internal validity can be a strength in qualitative research since reality does consist of multiple sets of mental constructions and as long as account is taken to perspectives of the interviewee and these are interpreted correctly, a high degree of internal validity can be achieved. To improve the internal validity we have used data triangulation in interviewing personnel from three departments, asking them the same questions to confirm our results and have repeated studies of the same phenomena from different perspectives. Further, each of our twelve research interviews has been transcribed and sent back to the interviewee for the controlling of facts from the participants (Merriam 1994). The process of the study is built up as a pattern-matching process, as described earlier, why the internal validity should increase (Yin 1994).

External validity deals with the problem of knowing to what extent a study's findings are generalizable beyond the case study itself (Yin 1994). However, both Merriam (1994) and Yin (1994) argue that this problem is of concern only if the external validity problem of quantitative research is directly applied to qualitative research. Quantitative research is based upon statistical generalization, whereas case studies rely on analytical generalization in trying to generalize and gain in-depth insights from a particular set of results applied to broader theory, why external validity is not a major concern for case studies (Yin 1994). To increase the external validity, we have studied one phenomenon using a multi-case approach, where the cases have further been cross analyzed (Merriam 1994). However,

as case studies are made to gain understanding and increased knowledge of the already known, generalizability is not needed to the same extent as in hypothesis testing (Merriam 1994).

Construct validity according to Yin (1994) refers to the use of correct operational measurements for the concepts being studied. For case studies, Yin (1994) further argues that to improve construct validity, multiple sources of evidence should be used during data collection. We have aimed for gaining construct validity through interviewing people from several organizations along with several persons in each organization, and crosschecking data in the literature review.

5. Results

5.1 Description of the Hospitals

	Size - Hospital Beds (Total)	Number of Employees	Number of patient visits (yearly)
<u>Hospital A</u>	550	>3500	360 000
<u>Hospital B</u>	96	600	120 000
<u>Hospital C</u>	600	3000	85 000 *

Table 4. General facts of the studied three hospitals. Source: Purchaser A, B and C. * Refers only to appointments with physicians.

The general information in Table 4 illustrates how Hospital A and C are larger hospitals, whilst Hospital B is smaller. Further, Hospital B does not have a Medical Technology Unit (MT) of their own, but cooperates with technicians from a larger hospital in their county (Purchaser B Mar 2011). Hospital A is the only hospital having MT as a contracting unit, being delegated purchasing authority by the county council, why employees at the unit are both technicians and purchasers (Purchaser A Mar 2011). Purchasing of patient monitors occurs around every seventh to tenth year and often become cyclical. “Since those units procured together last time, they will automatically have the same purchasing cycle and procure together again today.” - Technician C (Apr 2011) . The length of an average purchase process is about two years from the *funding request* (see Appendix 1) to the signing of the contract. A project group is often created to run the BDP, set criteria and evaluate tenders.

From now on, each profession – purchaser, technician and clinician – will be denoted by a capital letter indicating profession and a lowercase prefix indicating hospital, e.g: Purchaser A, P_A. Information not referred to anyone particular is a general perception of all interviewees at the hospital. More information about the interviewees’ positions can be found in Appendix 3.

Purchaser A, B and C (P_A, P_B and P_C) administrate the whole BDP, from the approval of the funding request until receiving of the product, including tasks such as compiling documentation, setting deadlines and controlling compliance with LOU, why they often function as project managers, despite the clinics being project owners in needing the product. P_B, as a solicitor, also signs the

contract after the choice of supplier. Technician A and C (T_A and T_C) make regular inspections of the equipment and participate in the whole BDP, from reviewing the clinicians' funding requests to see if they are reasonable, until the final setup of purchased monitors. Technician B (T_B) is employed at a Swedish hospital that cooperates with Hospital B and therefore only provides technical advice during the BDP, assuring that technical requirements are fulfilled, yet is not further involved in any stage. Clinician A and C (C_A and C_C) are nurses with responsibility for technical equipment, whereas Clinician B (C_B) is a clinical manager.

5.2 Purchase Processes

5.2.1 Hospital A

Hospital A	Described Process											
Purchaser A		1) Technicians remind clinical managers to start the funding-request	2) Funding-request made by clinical managers (in county database)	3) Ranking and prioritization of funding-requests	4) Funding decision made by county council (may take several months)	5) A project group is put together - purchaser, technicians and clinicians	6) Compiling specifications document		7) Test-exhibition			
Technician A	1) Technicians notice need for new equipment	2) Technicians notify clinical managers of need for new equipment	3) Funding-request made by clinical managers in database	4) Ranking and prioritization of funding-requests	5) Funding decision made by county council	6) Project group is put together - purchaser, technicians, clinicians and IT	7) Compiling specifications document	8) Sending the specifications document to potential suppliers	9) Test-exhibition	10) Evaluation of tenders	11) Signing contracts	12) Installation of equipment
Clinician A	1) Clinicians of need for new equipment	2) Inform MT or clinical manager that new equipment is needed	3) Funding-requests are made	4) Gathering info; procurements in other counties and screening the market				5) Companies announce their offerings	6) Test-exhibition	7) Evaluation of tenders		

Table 5. Description of the stages in the BDP, as perceived by employees, at Hospital A. The numbering indicates the order of the stages according to each profession's perceived order of appearance.

In Table 5 the BDP at Hospital A as described by each profession is illustrated. The project group runs the purchase process and participates in all the stages. The funding request and ranking of needs are conducted both internally at the hospital and externally at county level. All professions participate in formulating the specifications document and weighting criteria. When writing the specifications document, other hospitals' documentation is studied. During the test exhibitions, the project and reference groups, with technicians and clinicians, test the products, and then the project group evaluates the tenders through grading them on each criterion. There is also a risk group, conducting risk assessment of products, and a reference group testing the products present. T_A states that procurements are always made with and through technicians, as when clinicians need new equipment, they often initially contact technicians. In other cases, technicians notice that equipment is worn-out or there is a lack of spare parts and thereby recognize the need.

The most time-consuming steps according to T_A and C_A is formulating the specifications document and evaluating tenders, and the reason according to C_A is discussions of opinions among employees, as the purchase is often made simultaneously for several clinics. All three consider the formulation of the specifications document as the most important since if well formulated, evaluation of tenders is easier and less time-consuming. "With a poor need assessment, you will never get a product that matches the purpose: a safe and efficient care" – Purchaser A (Mar 2011). "With bad preparations, the tenders will be widely diverging, and therefore good preparations are key." - Clinician A (Apr

2011). Further, T_A mentions the importance of test exhibitions. C_A states that a prolonging factor of the process is a poorly made specifications document along with changes in political governance, which often results in delays in their approval of funding.

5.2.2 Hospital B

Hospital B	Described Process										
Purchaser B		1) Funding-requests are made by clinical managers		1) A project group is put together	2) Compiling the specifications document with MT at cooperating hospital	3) Purchasing unit presents procurement material; advertising,	4) Controller looks over need for investment and current equipment	5) Evaluation of tenders	6) Purchase	7) Delivery and installation	8) Post-purchase evaluation
Technician B	1) Continous meetings are held with the managers from Hospital B where need is recognized	2) Funding-requests are made by clinical managers		3) Clinical managers, part of the project group, contact technicians to start the purchase process	4) Compiling of the document of specifications		5) Test exhibitions	6) Evaluation of tenders		7) Delivery and installation	
Clinician B	1) Clinical managers acknowledge the need for new equipment		2) Market analysis		3) Compiling of the document of specifications		4) Test exhibitions	5) Evaluation of tenders	6) Signing the contract		

Table 6. Description of the stages in the BDP, as perceived by employees, at Hospital B. The numbering indicates the order of the stages according to each profession's perceived order of appearance.

In Table 6 the purchase process at Hospital B is illustrated through different perspectives. The purchase criteria are set through discussion, and tenders are evaluated with respect to the set mandatory and preferred requirements. During the post-purchase evaluation, P_B informally – to reduce administrative work – asks the clinical manager and the clinician responsible for medical technology, which in turn are to ask other employees, whether the equipment fulfills their expectations and how the delivery has progressed.

“We have the opportunity to report our opinions on the equipment, what we believe is lacking and what is satisfying. That’s about everything we do in the purchase process. [...] if we need to purchase anything new we know what type of product we want and our requirements on it” – Clinician B’s (Apr 2011) perception of her involvement in the BDP.

Writing a proper document of specifications and deciding criteria and their monetary value is stated to be 1/3 of the process in terms of time, according to P_B . Further, the evaluation of tenders is 1/3 and the last 1/3 is allocated to market analysis, where suppliers previously known by employees are consulted to receive information on market updates, along with administrative issues such as completing information in tenders. T_B also acknowledges the compiling of the specifications document as requiring the most workload, yet states that test exhibitions are more time-consuming. Both P_B and T_B consider the compiling of the specifications document to be the most important stage. “It cannot be emphasized enough that it has to be the need of the users that control the content [of the specifications document], and if they do a poor work it will be reflected in the tenders and have enormous consequences for the result” – Purchaser B (Mar 2011).

According to P_B and T_B , the operational workload and engagement of the clinics is the major factor prolonging the process, especially as Hospital B is a smaller hospital where the removal of a clinician

means large productivity losses for the clinic. T_B also states the amount of tenders to evaluate as affecting the length of the process. C_B refers to the market analysis performed to find existing suppliers as a step that can prolong the process.

5.2.3 Hospital C

Hospital C	Described Process									
Purchaser C			1) Need for new product acknowledged through fund-requesting		2) The funding is approved by the county council	3) The procurement process starts through creation of a project group	4) Decide on purchase criteria and compile specifications document		4) Evaluation of suppliers and offerings	
Technician C	1) Need for new equipment noticed through maintenance	2) Remind clinical managers to fund-request	3) Fund-requesting	4) Market analysis and information search		5) Initial meeting, discuss and specify needs	6) Compile specifications document	7) Test exhibition	8) Evaluation of suppliers and offerings	9) Installation
Clinician C	1) need for new equipment noticed through usage	2) Make clinical managers aware of that new products are	3) Fund-requesting	4) Market analysis & visit other hospitals to		5) A project group is put together	6) Compile specifications document	7) Test exhibition	8) Evaluation of suppliers and offerings	10) Follow-up and evaluation

Table 7. Description of the stages in the BDP, as perceived by employees, at Hospital C. The numbering indicates the order of the stages according to each profession's perceived order of appearance.

In Table 7 the purchase process at Hospital C can be found, as described by different professions. When asked to specify the stages in the BDP P_C simply states that they follow the structure of LOU. T_C points out that technicians are the ones aware of when it is time to purchase new equipment, especially technically complex patient monitors, and remind clinicians to request funding. C_C states that the need for new products is recognized through her noticing that old equipment is worn-out, or that technicians inform that spare parts are lacking.

T_C states that technicians perform a market analysis with suppliers they are aware of, *prior* to the procurement start, invited to demonstrate products to illustrate updates in the marketplace. The specifications document is created through discussions between technicians and clinicians to specify and adjust clinicians' requirements to make them feasible in terms of mandatory and preferred requirements. Previous specifications documents and documents of other counties are studied. During the evaluation, tenders are compared and graded on how well they match the criteria set, weighted according to price, ease-of-use and functionality. The suppliers are only present during test exhibitions or if clarifications are needed, according to both P_C and T_C , as the process is confidential.

P_C and T_C both consider the compilation of the specifications document as the most important stage as it is the basis for the evaluation and rest of the BDP. This is also considered the most time consuming stage, 60% of the total BDP time according to P_C , or several months, as stated by T_C . C_C mentions the preparatory work and specifically the visits at other hospitals as crucial. C_C and T_C also mention the test exhibitions as time consuming.

Both P_C and T_C state that a prolonging factor of the BDP is the operational burden of the buying clinic and the engagement of the clinicians, where T_C thinks that clinicians sometimes rely too much on the work of technicians. Further, P_C states lacking availability of test products for exhibitions as a

prolonging factor. C_C cannot think of any specific factors that prolong the BDP and states that each step requires its time and that the purchaser keeps track of which stage they are progressing to.

5.3 People Involved

5.3.1 Hospital A

According to all professions, the BDP can start when MT, as a result of maintenance, initiates the funding request, where purchasers and technicians help clinicians formulate it to be in line with standards, why they are in close cooperation. Clinicians start the funding request through clinical managers directly or contact MT who in turn contacts clinical managers. C_A states that the need also can be identified by clinicians, who inform the clinical manager. As politicians decide on the funding they set the framework for the purchase.

On average, the project group consists of clinicians – chosen by the clinical manager – purchasers, technicians and if necessary an IT technician. The reference group consists of clinicians that, together with the project group, test the products. “If too few are allowed to state their opinions, the decision won’t be embedded at the clinic and you will probably face resistance there.” - Technician A (Apr 2011), describing who is involved in a procurement. The purchaser, as project leader, governs and decides deadlines for each process stage, but the clinical manager and MT sign the final contract, being delegated by the county council to make the final decision.

T_A states that technical skills are vital for the formulation of the specifications document, the evaluation of tenders and the physical installation. The project and reference groups make the evaluation of tenders with the specifications document as a basis and the risk group evaluates risk scenarios and thereafter all evaluation material is compiled. ”The reference group’s statements are the basis for evaluation. Together with consideration of the price, their opinion is everything.” – Purchaser A (Mar 2011). Regarding the possibility for people outside the project and reference groups to affect the purchase decision, C_A says that if someone has input they can talk to him or a manager. However, he does not find these comments from other clinicians to have any particular impact, since they are not included to the same extent as the opinions of the project group in the evaluation stage.

Both T_A and C_A see purchasers as a central point for communication and information flow, as they receive copies of everything written internally about the procurement. The communication and coordination between departments purchasing similar equipment is handled mainly by purchasers, but also by technicians. According to T_A and C_A , technicians handle part of the communication with suppliers, but they always report to purchasers, and clinicians only have contact with suppliers during test exhibitions. Instead, P_A (Mar 2011) believes that only purchasers handle the contact with

suppliers during the procurement and states: “We tell the [employees] that they cannot have contact with suppliers during the procurement, to give [suppliers] the same info and treat them equally.”

A uniform perception is that clinicians focus on user aspects while purchasers have a more administrative focus. However while T_A says that technicians focus on both administrative and user aspects, P_A thinks technicians mainly focus on user aspects. “MT both has an administrative and technological focus since it includes both purchasers and technicians.” - Clinician A (Apr 2011).

5.3.2 Hospital B

Uniformly it is said that the need for new equipment is recognized by the clinic in two possible ways: (1) the clinical or regional managers inform P_B if operations are to expand or (2) equipment is worn out, acknowledged by clinicians or technicians servicing equipment. T_B and C_B states that the clinical manager in particular decide whether there is a need for new equipment and starts the process, yet is usually not further involved in the process. According to T_B , clinical managers occasionally directly contact MT at the cooperating hospital to start the process, but are referred back to their own purchasing department that has to be involved for the process to be assured to be legal. Further, the county council has to approve funding before the purchase can start.

“You need clinical personnel as part of the group, you need technicians that can make certain judgments [...], you need a nurse who can check the functionality and ease-of-use and then the purchasers control the legal part – everybody has to pull their weight.” – Technician B (May 2011), in stating the importance of having several units involved in the purchase of patient monitors. P_B says that she takes the formal decision of the purchase and signs the contract as she is delegated the authority by the county council. However, the project group has, in the evaluation process, taken the actual decision and she thinks that, in the case of patient monitoring, technicians have the largest impact on the purchase. C_B states that the clinical manager signs the final contract.

To affect the criteria set in the specifications document, C_B and P_B say that staff can talk to the project group, and C_B believes that the personnel spontaneously would act if they had any special opinions. The technicians, here having a consulting role, cannot affect the purchase criteria according to P_B , who also claims to have a pedagogical role in interpreting the clinicians’ requirements for the specifications document. This to create a good balance between mandatory and preferred requirements, as they are practically oriented people not used to reinterpret their work into theoretical terms, why clinicians sometimes request certain equipment, rather than specifying their need. “When [the clinicians] see all the new equipment [at fairs] and talk about revolutionary new technology, of course that affects them as purchasers of a new product” – Purchaser B (Mar 2011).

According to T_B , the purchasing department controls the flow of information passing between

purchasers, technicians and clinicians as everything is reported to the purchasing unit. “The purchasing unit is, in some ways, a coordination and communication center” – Clinician B (Apr 2011). According to P_B and T_B , purchasers have contact with suppliers during the process. After the purchase, clinicians are in contact with the suppliers on a more daily basis in terms of service and check-ups. According to T_B , others, such as technicians and clinicians, may get in contact with the suppliers during test exhibitions, but that is not ideal.

All three believe that purchasers handle administrative work in assuring compliance with regulations. P_B and C_B think that clinicians focus on functionality and usability, whereas T_B believes that both technicians and clinicians focus on functionality, but that technicians have an explicit responsibility for controlling medical technology requirements.

5.3.3 Hospital C

Uniformly it is said that the need for new equipment is identified when (1) clinicians – as users – notice that equipment is worn-out and contact the clinical manager or purchasers, or (2) when technicians serve old equipment, reminding the clinical manager to request funding. Purchasers start the procurement as soon as the county council has approved the funding.

Clinicians - nurses and doctors selected by the clinical manager, - staff from MT and P_C compile the specifications document, but P_C merely supports administratively. T_C and C_C denominate P_C as process controller due to her setting deadlines and having knowledge about LOU. T_C perceives technicians as better knowing how time-consuming each step is, compared to clinicians. P_C perceives the governing of the process as a joint task for the project group, since everything is ventilated in the reference group and reported to the clinical manager. P_C and T_C state that the project group collectively makes the final purchase decision in the evaluation stage, and the chief purchaser and clinical manager sign the final contract, but are further not involved in the process.

Regarding possibilities to influence the purchase decision, outside the project group, P_C says: “I presume that people in the reference group discuss with the rest of the staff at their clinic if anyone has comments [on the purchase]” – Purchaser C (Apr 2011). T_C and C_C mean that several people outside the project group affect the purchase and stresses the importance of involving clinical staff, outside of the project and reference groups. C_C believes that there are stakeholders in every purchase and says: “The way we act of course affects others, as for example the ambulance. It is very convenient if we have the same ECG-cable as they do, since we then can shift and switch cables when we move the patient.” – Clinician C (Apr 2011).

Both T_C and C_C state that purchasers function as a communication central for the project group and if several clinics purchase similar equipment. According to T_C , the main contact with suppliers is

handled by P_C in order to be correct and professional. “She knows what she can and cannot say. My tongue can slip sometimes, and the clinics are definitely not to talk with [suppliers].” – Technician C (Apr 2011). C_C says that the only contact between clinicians, technicians and suppliers is during the test exhibitions, while clinical managers, together with technicians, have contact with the supplier during installation.

All professions agree upon that purchasers have an administrative focus. C_C and T_C consider clinicians to focus on usability, whereas technicians focus on both administrative and usability aspects, with a slight dominance towards usability regarding maintenance. According to C_C , purchasers know more about the BDP than clinicians, and T_C describes clinicians as optimistic regarding the administrative part of the process; “They believe the compiling of specifications document will take about one afternoon [...] and they are more concerned with the well-being of the patient. Getting there is not considered too exciting or engaging.” – Technician C (Apr 2011).

5.4 Purchase Criteria

5.4.1 Hospital A

The most important criteria according to P_A is (1) clinical function, performance and technology and (2) ease-of-use and ergonomics – features further specified in templates. “The first criterion determines the functional level of the equipment, but this doesn’t matter if you have a useless ergonomic solution - you need to have both.” – Purchaser A (Apr 2011). P_A believes, and T_A confirms, that important criteria for technicians are supplier support and technical solutions that reduce the workload of MT. T_A further values connectivity, easily accessible suppliers and that status logs of equipment are readily available. “I don’t care so much about how easy it is to use the products, but since it is me that [the clinicians] will contact if they do not understand how to use it, I still value it, but it’s not crucial to me.” – Technician A (Apr 2011), talking about her view on ergonomics. C_A states that patient safety, reliability and ease-of-use are most important in terms of how clinicians’ understanding of the product ultimately lead to increased patient safety. C_A says that MT foremost looks at the medical aspect of security and service. P_A also points out the administrative criteria such as the supplier following the law and paying taxes.

In deciding the selection criteria, purchasers, technicians and clinicians gather and value each criteria using templates. The weighting of criteria is: around 2/3 on ease-of-use, around 1/4 on technology and the rest – less than 1/10 – on that the supplier meets required standards. The final selection of suppliers is made through calculating the LCC along with a penalty premium for each criterion that is not completely met, weighted according to the importance of each criterion. “The ease-of-use is

considered very important, why a large penalty premium is associated with not meeting those types of requirements, which is more important than a good status log.” – Technician A (Apr 2011).

Neither T_A , nor C_A can think of any additional criteria that arise due to LOU. C_A says that he follows the same procedure in smaller purchases where procurement is not necessary: screening the market and contacting suppliers. P_A finds that without LOU, the administrative process would be reduced incredibly and she thinks that they would be working a lot more with references. ”It is very hard to work with references today according to LOU, [...] it is possible, but requires an extreme amount of administration, why we don’t do it.” – Purchaser A (Mar 2011).

5.4.2 Hospital B

P_B thinks that the most important purchase criteria for technically complex products are support and availability of spare parts, yet she points out that the price is of great importance and is put in relation to the mandatory requirements from the specifications document, but for medical technology, price often has a small significance in relation to standards. T_B and C_B mention patient safety as most important, where C_B wants the risk for mistakes to be minimized. T_B also cares for availability of spare parts, technical safety, that the product is easy to clean and water resistant, so that cleaning does not result in additional costs of service. In the end, as P_B points out, the most important aspect is that the product functions as it is supposed to. “I couldn’t pay for just anything. If it doesn’t work for the user, it’s worthless.” – Purchaser B (Mar 2011).

P_B believes that the clinical personnel might require ergonomic qualities as the product must be easily moved and connected to other equipment. She also believes that the clinical manager cares particularly about maintenance intervals and depreciation and that criteria used by technicians are amount of service needed and installation time, all in relation to LCC. “[The winning product] was neither the cheapest, nor the most expensive, but in the lower segment and it was absolutely outstanding ergonomically! Not even the most expensive equipment outperformed it ergonomically.” – Purchaser B (Mar 2011) about their last procurement. P_B states that clinicians may request a certain brand, often the brand present at the hospital, due to recognition in the handling, which is not allowed according to LOU as criteria must be formulated in terms of a certain need, not a certain brand or product. C_B believes that purchasers care more about economy and price, while technicians care about service contracts and intervals. T_B believes that everyone cares about nothing but patient safety and functionality. Ultimately, criteria are weighted where price is 30 per cent, functionality 30 per cent and ease-of-use 40 per cent.

Neither T_B , nor C_B , believe that any criteria are added through LOU, since in the end, the need still has to be fulfilled. Rather, C_B thinks that LOU affects the purchase process in demanding thorough

market analysis and documentation and without it; there would have been more direct purchase. P_B believes that certain criteria would not be used in the absence of LOU, such as requirements of documentation from suppliers.

5.4.3 Hospital C

The most important purchase criterion is uniformly stated as ease-of-use of the product, since C_C thinks that it has to be easy to perform the right operations, and T_C particularly cares about user interface and information presentation on the screen. Further, T_C mentions safety and risk in terms of “what-if” analyses – e.g., if they run out of power, – connectivity, and good service and sales organizations of suppliers, where small companies are stated to be more committed and personal. Further, C_C values safety and that the product contributes to a good working environment for the clinical staff. P_C cannot think of any criteria that might be more important to others than ease-of-use as the majority of the criteria are based on functionality and desired results – the need of the clinic is the main determining factor for criteria. T_C imagines that clinicians consider the working process in handling the equipment – that it is easy to move and read. Further, he states that connectivity appeals to both clinicians and technicians. C_C believes that MT also would be concerned about how easy the apparatus is cleaned, back-up and service issues.

P_C, T_C and C_C believe that no additional criteria are added due to LOU. “It’s all about closing a good deal and I don’t think it would matter [if LOU did not exist]” – Purchaser C (Apr 2011). T_C states that in the absence of LOU, purchasing would not be conducted through procurement, and technicians would probably not participate. “It would probably be handled directly by physicians as back in the days. “We are thankful for the existence of the law.” – Technician C (Apr 2011).

5.5 Summary

The interview findings have illustrated the buying behavior of each studied hospital. The interviewees’ perceptions have been presented in terms of our three studied variables – process, people and criteria – which have provided a foundation upon which the analysis is built.

6. Analysis

In this chapter we aim to analyze our results together with theory and relevant literature studies. The analysis first presents our model and thereafter follows the chronological order of the BDP for hospital buying of technically complex products according to three identified phases; initial, mid and final phase.

6.1 A model for hospital procurement of technically complex products

	Stages of the Procurement Process and the Involvement of Buying Center Participants											
Developed BDP for hospitals buying technically complex products	1)Identification of a need	2)Notify clinical manager	3)Fund-requesting	4)Market analysis	5)Funding approved by county council & project group created	6)Compiling specifications document	7)Recieve & administer tenders	8)Test-exhibition	9)Evaluation of tenders	10)Signing contract	11)Installation	12)Post-purchase evaluation
BDP Jobber (2007)	1)Recognition of a need	1)Recognition of a need	2)Determination of specification and quantity of needed item	3)Search for and qualification of potential	2)Determination of specification and quantity of needed item	2)Determination of specification and quantity of needed item	4)Acquisition and analysis of proposals	4)Acquisition and analysis of proposals	5)Evaluation of proposals and selection of suppliers	6)Selection of an order routine		7)Performance feedback and evaluation
Phase of process	INITIAL PHASE				MID PHASE					FINAL PHASE		
Purchasers	None	None	Low	Low	High	High	High	Low	Moderate	Moderate	Low	Moderate
Technicians	Moderate	Moderate	Moderate	High	Low	High	None	High	High	None	High	High
Clinicians	High	High	High	High	Low	High	None	High	High	High	Moderate	Low
Purchasers					Influencer	Influencer			Influencer	Buyer		
Technicians	Initiator					Influencer		Influencer	Influencer			
Clinicians	Initiator, user					Influencer, user		Influencer, user	Influencer, user			
Clinical Managers	Buyer, user	Buyer, user	Buyer, user		Gatekeeper					Buyer, user		
County Council					Influencer, Gatekeeper							
Project Group						Decider			Decider			

Table 8. Row one describes the hospital BDP based on the three studied cases, put in relation to Jobber's (2007) model, seen on row two. The coloring is based on the stages of Jobber's (2007) model, where each color corresponds to a certain stage. Similar coloring in the two processes indicates similarity in their respective stages. The table further describes the intensity of involvement and the DMU-roles of each influencing actor in each stage, based on the descriptions by the interviewees in each of the three studied hospitals.

Table 8 illustrates stages identified and people involved in all studied hospitals, interpreted into a general model of the buying behavior for hospitals studied when buying technically complex products. Each stage present in theory can be found in our general model; thus, in broad terms they are similar. However, our model deviates from theory in having more stages. We find two major reasons for its extensiveness: (1) as LOU governs the procurement process, hospitals are obliged to go through all steps when purchasing equipment above a certain threshold value and (2) the product complexity results in a need for many aspects to be considered, why several participants and professions are involved in the BDP making it rigid regarding time and amount of stages. The fact that LOU governs the BDP makes it more predictable as confirmed by Vaalamäki (2009), which highly facilitates the generalization of our three cases into a common model. The complexity implies that even in the absence of LOU, the BDP would have been extensive, a view supported by theory of Kotler and Armstrong (2010). Thus, if the Swedish healthcare sector would be deregulated, these structures and processes would probably still be present to a large extent.

Despite our attempt to develop a common model for the hospitals studied, deviations are still present as a result of *organizational* and *environment factors*, visible in our results and further supported by theory. In Hospital A, the funding process, corresponding to our stage (3) and (5), is more extensive due to the ranking of requests being coordinated externally with other hospitals in the same county – an *organizational factor* – resulting in an additional step (see Table 5). Stage (4) in our model, market analysis, is missing for Hospital A, potentially due to its MT having purchasing authority why technicians are closer tied to the BDP and perform more informal continuous market analysis. At

Hospital B, step (2) – to notify the clinical manager – is missing as clinical managers notice the need themselves, due to the hospital's small size, whereby clinical managers have a more complete overview of the clinic. This makes the notification unnecessary per default. Further, the absence of a MT results in continuous managerial meetings with the cooperating hospital to discuss equipment, why an explicit notification stage is non-existent. The post-purchase evaluation stage (12), is not recognized by many employees, yet is still included in the developed model as the exclusion of it probably is a result of the stage being informal at all studied hospitals to reduce the administrative work no longer required after the contract is signed.

Regarding involvement in the BDP, the major determinants of membership in the DMU for clinical managers and purchasers are *environmental and mission variables*. Clinical managers' participation is a result of the delegated authority from the county council – *environmental variable* – forcing them to participate. However, this can also be seen as an *organizational variable* in determining the level of management involved. Clinical managers may not have participated at all in the BDP if not delegated the authority, as they do not participate in any other stages than obliged to, since it is common that clinical managers only make the funding request and sign the final contract. The *purchase-specific variables* clearly affect the clinicians' involvement in the DMU; without their participation as the producers of hospitals' ultimate output – patient care – the need-driven process stops. Technicians are rather members due to *organizational variables* since the complex technical aspect of patient monitors creates a need for joint departmental decisions, requiring technicians' participation. The purchasers' role in the DMU is legitimized by their knowledge of LOU, as the regulations create the external environment of the purchase in demanding compliance, in line with the findings of Liedes and Liimatainen (2010). Without LOU, they would probably still participate, but not to the same extent. Overall, *organizational variables* determine *all* professions' membership of the DMU in terms of hospitals' purposes to ensure patient care; clinicians due to their daily usage of the product; technicians adding technical viewpoints and purchasers as administrators, required by LOU. Moreover, as pointed out by T_A, it is desirable to have many DMU members to ensure anchoring of the purchase decision within the whole organization.

6.2 Initial Phase

The first step of the initial phase is identification of the need, and then the phase covers the funding request and ends with a market analysis. The first step – identifying the need – is made either by clinicians using the products, reporting to clinical managers who request funding, by clinical managers themselves, or technicians serving the products, making all these people *initiators*. Clinicians and clinical managers also have the role as *users* of the product and therefore continuously participate to some degree in the BDP, probably specific for the healthcare industry where purchasing is

extremely need-driven. Our model then deviates from Jobber's (2007) in the second step regarding specification, which becomes a protracted process in the adding of an additional stage. This is a result of the *buying environment*, where organizational and political policies places constraints on the process in forcing clinical managers to request funding.

Clinicians in general seem critical to the BDP as they start it, and as the ultimate goal is purchasing the product that best meet patient needs – a knowledge area exclusive for clinician – they cannot be substituted by other professions. This is in line with Laczniak's (1979) findings of clinicians' importance and strong involvement in the early stages of the BDP, yet in our results, even if highly involved, they are not as active as other professions. Despite their importance, they do not seem to move the process forward due to their time-consuming regular duties, but instead only participate when told, creating a bottleneck in the BDP. Purchasers and technicians perceive it as though clinicians rely on them in handling the complete process even though clinicians are the final users of the product. This is also seen in how clinicians often mention completely different stages than other professions (see Table 5, Table 6 and Table 7) and tend to only mention the steps that they are included in themselves, illustrating their strong professional focus in the BDP, prioritizing patient safety and usability, partially ignoring the administrative aspects.

Our developed model then moves on to the market analysis, corresponding to stage three in Jobber's (2007) model, yet makes an unexpected loop and returns to Jobber's (2007) second step. The loop occurs as the large time span between procurements result in market updates and potential replacements of staff, why extensive problem solving through market analysis is required to update staff to be able to complete the specifications stage. Following this extensive problem solving is that the purchase can be considered to be of Robinson's et al (1967) buyclass *new task*, instead of *modified rebuy*, which would otherwise be the case when replacing worn-out equipment. The loop is created as the market analysis includes contact with suppliers – not allowed by LOU during the procurement – why it has to be performed before the project group is put together, leading into the mid phase. As purchasers compile the project group, they can be seen as *initiators* since they start up the actual procurement. Purchasers do mention the creation of a project group as a stage, while other employees rarely recognize this, probably since purchasers see it as a *task-variable* whereas others only find themselves as being part of the group. This also illustrates a general characteristic of the hospitals' BDP's; purchasers have the most knowledge about the actual process and an administrative focus, even though they in this study do not always mention all the stages in their explanations, since they consider it to be common knowledge to simply follow LOU.

6.3 Mid Phase

The mid phase, the most extensive part, marks the starting-point of the actual procurement with the approval of funding and compilation of a project group. It further includes specification of criteria, the gathering of tenders, test exhibitions and ends with the evaluation of tenders. In this phase, the county council acts as *influencer*, since the funding decision affects the complete BDP in setting budget constraints, and also *gatekeeper* in terms of time as the procurement cannot start before the funding is approved.

The next step, formulating the specifications document, is the most important according to all purchasers and technicians. Clinicians' opinions vary, yet all concern the preparatory work. We believe that the preparatory work is considered as most important due to two reasons (1) it has a clear effect on the workload and efficiency during the evaluation of tenders, further illustrated by the quote by Axelsson (Mar 2011), introducing this thesis, where the crucial implications of the non-existing possibility to alter criteria are described. His view is supported by our findings along with theory and literature presented on the subject, such as T'zeng et al (2007). (2) The risk of buying the wrong product is associated with high cost – both administratively and with respect to patient safety. Our analysis is further supported by the clear relationship found between the perceived importance of the stages and time spent on each stage, where our results are in line with Laczniak's (1979) of the specifications stage being the longest. This is the only stage where all professions have high involvement, as seen in Table 8, whereby many viewpoints have to be discussed, probably prolonging the stage. Further, the test exhibition is a stage mentioned as time-consuming due to its dependence on the workload of clinicians, which further confirms our belief of their large impact on the BDP. Another finding is that each profession considering the stages they are most present in as most important and time-consuming, reflecting the sometimes conflicting views on the BDP between the professions and each profession's opinion of their own contributions as crucial.

It is evident that technicians, in the stages they participate in, are highly involved and function as a link in working closely with both purchasers and clinicians respectively, where an example is how technicians review clinicians' funding requests to match purchasers' requirements. This is also apparent in them being able to recite the stages of the *whole* process, indicating their knowledge of administrative aspects. Simultaneously, they have a strong focus on user aspects of the product tying them to clinicians. Thereby, they can be seen as *linking pins*, connecting the two other professions, and more specifically as *professional linking pins* since their usability focus overrides the administrative. This is especially noticeable in Hospital A as their MT employs both purchasers and technicians, making technicians even more knowledgeable about administrative aspects, not seen in Hospital B, lacking technicians at the hospital. However, Hospital B's clinicians occasionally contact technicians

to start the procurement, ignoring the purchasers' initiating role in starting the procurement. One could argue that clinicians have the most focus on patient care, characterizing *professional linking pins*, yet they do not have a connecting role between other professions. Purchasers can also be seen as *linking pins*, being recognized as central for internal communication within the project and reference groups as well as between departments. Their governing and collecting documents to ensure that LOU is followed, makes them *administrative linking pins* in focusing on the well-being of the organization as a whole.

In the specifications stage, the criteria are set and when studying them an emerging picture is the clear relationship between the individual's profession, stages of participation and held DMU-roles on the one hand, and the criteria valued on the other. Each person values criteria according to variables used as a base for evaluation of their own results in line with Jobber's (2007) theory.

Purchasers' most valued criteria are strongly connected to those valued by technicians and clinicians – safety and ease-of-use – as purchasers are *administrative linking pins* and do not use the products themselves. However, being responsible for assuring compliance with LOU, they naturally value *legalistic criteria* and also have an overall cost perspective. They highlight how *economic criteria* permeate all criteria set, as price – today more often in the form of LCC - is always taken into account and is often weighted as a third of total criteria used, which is in line with Liedes and Liimatainen's (2010) and Farrington and Lysons' (2006) findings.

Clinicians foremost value patient safety and ease-of-use, further specified as ease of correct handling and performance of equipment, with a low risk of making mistakes and ergonomics, correlating with their *user* role. This makes clinicians' criteria in the *technical criteria* category, the core function of the product, further relating to them as *initiators*. Also, *social/organizational criteria* are used when clinicians return from fairs wanting the latest technology, not due to patient results, but rather due to status of the organization and staff or demanding a brand they are familiar with due to *nontask risk-reduction motives*, wanting to reduce the personal risk for mistakes. Further, *personal – or intrinsic – criteria*, are used by clinicians during test exhibitions, where their personal liking of the products is forwarded to the project group. Clinical managers, in addition to valuing usability, are concerned with depreciation and budget, being responsible for the clinic, further illustrating the valuation of criteria that they themselves are evaluated on.

In general technicians value patient safety, but in particular they value (1) a good service organization of suppliers, availability of spare parts and ease of cleaning – criteria aiming at reducing the workload of MT in the post-purchase process, without resulting in additional costs – and (2) connectivity with other equipment. Ease-of-use is only said to be of indirect importance for technicians, since if

equipment performs poorly in this aspect, clinicians will rely on technicians for help as they are *professional linking pins*, resulting in additional workload for MT. Despite technicians adding technical criteria in the specifications document, they do not look at *technical criteria* as defined by O'Shaughnessy (1995), relating to the core performance of the product, as this is the focus of clinicians when testing products. Instead, their most valued criteria is on a higher level, relating more to *adaptive criteria* in reducing uncertainty regarding suppliers through controlling for guarantees and availability of spare parts, and *integrative criteria* regarding installation and follow-up. As a reason for *adaptive* and *integrative criteria* to be included is to reduce the workload and costs of MT, it implies that *economic criteria* function as overall umbrella criteria.

Personal criteria are not much involved except for the people in the reference group's opinions when testing products, yet due to many criteria being set beforehand, these are of small significance when criteria are weighted in total. Rather, the use of *personal criteria* is seen in how all valued criteria by each profession – even if not personal in its category – are relating to the direct relationship between *task* and *nontask*. This as criteria valued often relate to the wish for the subsequent performance of each profession to be good (*task*), to be perceived as a good employee (*nontask*). Thus, the motive behind each valued criteria nevertheless seem rather personal, and have a clear link to the BDP stage where each profession is present; purchasers concern for legalistic criteria in administering the BDP, technicians involved in post-purchase stages are concerned with service, and clinicians' focus on patient safety and ease-of-use as end-users. All in all, the criteria that each profession describes as important, coincides with what other professions state that the particular profession should find important, confirming that the criteria mentioned in our results are the major purchase criteria used to evaluate tenders of patient monitoring. Important to keep in mind though, is how the criteria mentioned as important by the different professions can be seen as *preferred requirements*, and offer a potential of differentiation for suppliers, while *mandatory requirements* regarding basic technical functions of the product are implicit, why technical criteria can be seen as fundamental criteria and taken for granted.

When administering tenders, purchasers have the main contact with suppliers during the procurement, why they can be said to have *boundary roles*, in line with Wind and Robertson's (1982) theory. However, as this applies only for the period of the actual procurement, the *boundary role* later shifts to foremost technicians as responsible for service after the contract is signed and until the next procurement starts, but also to clinicians when suppliers educate them in handling the equipment or when they visit fairs. Thereby we in total conclude that our findings are not in line with Wind and Robertson's (1982), as the head of the professional group – clinical manager – neither has a *linking pin* role, nor a *boundary role*. However, a similar pattern to Lacznia's (1979) is found where purchasers

are most active in the start-up of the actual procurement and thereafter their involvement decreases, as seen in Table 8. However, as the purchasers administer the whole BDP, they are present to some degree in all stages, except for identifying the need, controlling for the project group meeting LOU requirements, whereas clinicians and technicians perform the actual tasks relating to each stage.

In the last part of the mid phase – the evaluation stage – the final decision is made jointly by the project group, making the group in total *decider*, and each participant of the project group an *influencer*. However, purchasers only have a minor role of influence, as they mainly control for compliance with mandatory legal requirements. Further, the reference and occasional risk groups act as *influencers* as they are consulted for opinions. An implication of this is the large size of the DMU, both considering the amount of people and roles involved – a natural result of the many criteria and views required to ensure patient safety through the purchase. Further, other hospitals' specifications documents can be seen as a *influencer*, as it is consulted for inspiration of criteria. Clinical staff, even though not a part of the project group, are *influencers* as clinicians in the project group are to ask them for opinions, before deciding on criteria in the project group. However, the staff's influence is of limited significance, as stated by C_A, as the basis for decision is foremost the opinions of the project and reference groups during test exhibitions. Thus, the *influencers* are numerous, and have a clear impact on the size of the DMU and the criteria used for the final purchase decision.

Clinicians in the project group can act as *gatekeepers* in excluding clinical staff's opinions that are to be forwarded, if for example, trying to set criteria in favor of a certain brand due to *nontask risk-reduction motives* to reduce mistakes which there is a risk for when handling unfamiliar equipment. Also, clinical managers can be *gatekeepers* in choosing whom to include in the project group, but this has not been noticed in our results. However, all information has to be openly presented, why LOU prevents them from exercising their *gatekeeper* role. We reflect upon the fact that clinicians' operational tasks and lack of commitment are often mentioned by others to prolong the process, why clinicians rather can be seen as *gatekeepers* in terms of time. Possible *gatekeepers* would rather be purchasers as center for internal and external communication; however, they do not have motives for gatekeeping since they do not care about what specific brand is procured.

6.4 Final Phase and Ultimate Reflections

The final phase begins with the signing of the contract and further includes post-purchase activities, where technicians is the most involved profession. Usually, clinical managers sign the contract, making them *buyers*. However, this final authority is merely a procedure as the real decision is made jointly by the project group. Specific for P_B, a solicitor at Hospital B, and the purchasing manager of MT at Hospital A is that they sign contracts too, making them *buyers* as well. As procurement of patient monitoring can be considered a *new task* associated with high value and complexity, theory

implies high management involvement. However, we find the opposite where purchasers' involvement is higher than managers' as a result of LOU regulations. The complex nature of the BDP requires extensive knowledge of regulations, which clinical managers do not have, why purchasers need to be involved. However, we find – similarly to Lian and Laing (2004) and Mattson (1988) – large managerial involvement in the way clinical managers have the final signing authority.

Our step (11) – installation – lacks an equivalent in theory, probably due to our developed BDP being specific for complex equipment, why we in total can conclude that Jobber's (2007) framework is too general to obtain a satisfying picture of hospital BDP's. The same pattern emerges when comparing our model to Laczniak's (1979) hospital BDP model, where ours is more extensive and specific, probably a result of regulations having a clearer impact on the Swedish market compared to the American.

The suggestion by Lian and Laing (2004) that a relational approach to purchasing is emerging within public organizations, in terms of recommendations, is something our results both support and contradict. Before the actual process starts, other hospitals are sometimes visited during the market analysis, with potential for equipment recommendations to occur. However, as the procurement starts the viewpoint seem to be that LOU makes it administratively too complex to work with supplier references, why it is avoided, and rather support the authors' other findings of public purchasing being fairly transactional.

7. Concluding Discussions

In the following chapter the main results of our study are concluded and we will provide answers to our research questions along with managerial implications.

7.1 Conclusion

The purpose of our study is to describe and analyze the decision-making process for purchasing technically complex medical devices at hospitals in Sweden through studying purchasing of patient monitors. Based on theory and variables previously used in prior research to map purchase behavior, we study the problem from three different perspectives – process, people and criteria. We formulated three research questions and together with a general introduction, they are the structure of the following section to shed light on our key findings.

A clear pattern is the general extensiveness of the buying behavior; the length of the BDP both in time and in numerous stages, the many people part of the DMU in terms of professions and roles, and the many criteria used. In the end this is due to, in addition to organizational policies, the perceived risk of making mistakes in two aspects; (1) not following LOU and thereby get penalties,

and (2) buying the wrong product and thereby affecting patient care and safety. Another general pattern for buying behavior of complex nature is purchasers being on one side of the spectra and clinicians on the other, while technicians are a linking interface, as seen in all our three variables.

7.1.1 How is purchasing of technically complex medical devices conducted within hospitals in Sweden in terms of the buying process?

The BDP is extensive in terms of time and amount of stages, largely due to LOU requiring each step to be performed and the complexity of the products. The process can be divided into three major parts; initial, mid and final phases. The initial phase stretches from the identification of the need, covers the funding request and ends with a market analysis. The mid phase is the most extensive and marks the starting-point of the actual procurement with the compilation of a project group, and thereafter includes specification of criteria and ends with the evaluation of tenders. The reason for the mid phase's extensiveness is the perceived importance of the preparatory work, and the time allocated to it – seen in each profession's high involvement in those stages. This to include differing viewpoints to ensure patient safety in the product bought, as criteria set cannot later be altered. The final phase begins with the signing of the contract and further includes post-purchase activities.

7.1.2 Which people are involved in the purchase process and in what way do they have impact?

Clinicians and clinical managers in total possess every DMU role, but during different stages, giving them the clearest and largest impact on the purchase decision, despite their limited knowledge about the actual process. The key reason for the clinicians' large impact is their role as final users of the product, which makes them the sole most important profession in achieving the organization's goals for the purchase: patient safety and care. Technicians and purchasers are rather involved in the BDP due to the complex technical and administrative nature, respectively. Purchasers' impact on the actual decision is limited; they merely overlook the process and control for legal requirements, being the most knowledgeable about the BDP. Technicians have a larger impact, providing input on technical and post-purchase aspects, such as maintenance. Further they act as a link between purchasers and clinicians in focusing both on administrative and ease-of-use.

7.1.3 What are the major purchase criteria used to evaluate tenders of technically complex products?

In general, the basic technical functioning of the product is seen as mandatory – and if not fulfilled, a tender is not even considered – implying that technical criteria, such as ease-of-use, can be seen as overall most important. This is illustrated in how all professions have a common goal of attaining patient safety and care, which is strongly connected to technical function of the product and corresponds to the overall goals of the hospitals. However, price – more often in the form of LCC – is always taken into account, as all other criteria are weighted in relation to it. Although the project group jointly makes the purchase decision, it is based on the opinions of each profession that influence the decision. As a result of the differing opinions of professions being weighted together in

total, each person's valued criteria must be taken into account to obtain the complete picture of the purchase criteria used. Each profession's valued criteria has a clear link to the factors that they themselves are evaluated on, as well as where and how they participate in the BDP respectively; purchasers care for regulatory compliance, technicians for quality and availability of service and clinicians for usability. Important to keep in mind though, is how the profession-specific criteria can be seen as preferred, while the basic technical functioning of the product always will be mandatory.

7.2 Strategic and Managerial Implications

As mentioned earlier, it may be hard to know to whom, how and when companies are allowed to market products to hospitals due to LOU regulating the contact with the buying organization. If done at the wrong point in time – during the actual procurement process – buying organizations will not be receptive. As initially stated, despite regulations it is possible to affect the purchase decision, something that our study confirms.

As procurements of patient monitoring seem highly cyclical, marketing efforts should follow the same time cycle, yet slightly skewed to precede the cycle of hospital procurement of monitors. Prior to the start of the procurement, hospitals conduct market analysis, mapping market updates and the suppliers they are aware of beforehand. Given that a cycle is around seven to ten years and a procurement takes approximately two years, the hospitals should start their market analysis around six to eight years after the installation of the latest purchased patient monitors. Thereby, we believe that it is crucial to be part of this awareness set of suppliers, as the market analysis is the base for the formulation of the specifications document, where the criteria might be somewhat adapted to align with the product of some particular suppliers, due to the simple fact that these were the only companies included in the market analysis. The strategic implication of this is the importance of mapping the buying pattern of patient monitors by hospitals from a time perspective, to know when it is time to initiate marketing efforts – a procedure facilitated by all documents being public. Based on our results, the marketing efforts of suppliers seem reasonable to be started around five to seven years after the last finalized procurement of the hospital in question.

Theory and findings suggest that, in the end, individuals do the purchasing and different professions value different aspects, implying that a supplier's basic message is not applicable and attractive for each profession. For example, clinicians care about ease-of-use and handling the equipment to ensure patient safety, while technicians, in addition to patient safety and user aspects, value good service organizations of suppliers along with availability of spare parts. Thereby there is no value for suppliers to convince clinicians of their good service organizations, while this is a clearly positive differentiator in the eyes of technicians. Even though suppliers have company-wide differentiation features compared to other suppliers, the above stated implications are applicable when tailoring

messages with unique selling points in addition to basic functions, to each specific targeted individual belonging to a certain profession.

Even though purchasers are a natural point of entry for suppliers to come in contact with the DMU, they are not the strongest influencers on the buying decision, why purchasers should not be the only contact person with the buying organization for suppliers, if they wish to have at least the possibility to influence prior to the start of the procurement. Instead clinicians and technicians are the true link to reach the influential part of the DMU and if they care for a specific product, the supplier is more likely to be a part of the awareness set and thereby the market analysis. Thereby, the person that suppliers are in contact with should vary with the hospital buying cycle; main contact with purchasers during procurements, and main contact with clinicians and technicians in between. Purchasers do not have criteria relating to the product that they care for, however, they are still important to satisfy – seen as a hygiene factor for the complete DMU – in terms of suppliers complying with the administrative rules.

As long as a clear differentiation in an area perceived as important by any of the professions exists for the supplier, price is not the only determinant factor for the purchase decision. The major implication is that offered patient monitors need to have a perceived high value-for-money for the DMU. Price is instead an exclusion factor in the end, as each criterion is set in relation to the LCC of the equipment. In the results, this is shown by that the cheapest equipment is not always chosen, but neither is the most expensive one correlated to perceived high quality. This results in that, as long as suppliers have competitive prices, other differentiators – such as ergonomics and supplier service – are valued higher than price when weighting criteria. Connectivity is further an emerging important factor among the criteria set by the DMU, confirmed by the findings of Liedes and Liimatainen (2010). Therefore, it seems of increasing importance to create products that are compatible with other equipment already present at the hospital and thereby other brands.

The main takeaway is the cyclic pattern of hospital buying and the associated shifting in whom to be in contact with, and the importance of adapting the marketing message accordingly.

7.3 Discussion

Our study has resulted in the development of a general model of hospital buying of complex products in Sweden, based on three studied hospitals, with the aim to – to a larger extent than before – predict the process pattern, the people involved and what criteria they use during procurements. However, can it be applied in a broader perspective to other hospitals or other public organizations?

Flynn and Strehl (1996) and Vaalamäki (2009) state that public organizations with similar purposes have similar criteria and needs, which should imply similar purchasing processes, speaking in favor

for our model to be generalized for hospitals in Sweden. However, as we find deviations from our model even in our three cases, reflecting the dynamic nature of purchasing, we notice that generalizations are hard to make. Yet, since our results from the studied hospitals differ, we believe that the aspects that actually are common for these hospitals are possibly generalizable beyond the case study. Therefore our model seems applicable to other hospitals in general, and can hopefully contribute to a better understanding of hospital buying of technically complex products in Sweden.

In terms of our three studied variables, we believe that the process variable is more generalizable than the other two, as LOU places clear constraints and states how the process is to be conducted, making it more predictable (Lian and Laing 1994). This together with the complexity of products purchased leads to that the BDP of hospitals will to a large extent include the stages of our model.

Regarding other public organizations, the generalizability decreases, yet to some degree exists, as all organizations have to comply with LOU. The BDP stages, required by regulations to be performed, will be found in general when public organizations procure products above the same threshold value as the products in our study. However, the complexity that the healthcare aspect adds to the BDP – foremost in the user being a critical participant in the BDP and the product being crucial for fulfilling the organization's purpose – can probably not be found in other public organizations to the same extent. Further, similarly as Flynn and Strehl (1996) and Vaalamäki (2009) state that organizations with similar purposes have similar needs, the opposite should apply for organizations with different purposes, why the generalizability of our model to public organizations in general is limited.

Regarding the model's applicability for hospitals in other countries, we must separate the viewpoint into EU and non-EU countries. National laws on procurement in EU countries are based on the same EU-directive (Fryksdahl and de Jounge 2011) why the regulations are to be similar. Thereby, the process part of our model should be somewhat applicable to hospitals in other EU countries. However, in countries outside the EU, and particularly in the US, the applicability is low due to very differing regulations, sometimes contradicting to EU regulations (Tervahauta and Zackrisson 2004).

Compared to previous research, our study identifies more stages of the BDP than Lacznia (1979) and assigns criteria used to different professions beyond the DMU as a group, which Lambert et al (1997) do. We further complement the study of Liedes and Liimatainen (2010) by studying the Swedish market and confirm their findings, yet provide more detailed insights, due to our case study format. Highly interesting is that this study also confirms Lacznia's (1979) finding that Webster and Wind's (1972) model of buying behavior is applicable – even though 30 years have passed and despite the development of new models over the years.

7.4 Limitations and Suggestions for Further Research

The general model developed in this study gives a more thorough understanding of hospital buying of complex medical products in Sweden, yet as a result of our delimitations, only the buyer perspective has been studied. To generate an even more complete understanding of the hospital buying situation, the supply side should be taken into account as well. Even though the relations with suppliers are heavily regulated (Axelsson Mar 2011), it is reasonable to assume that they exist to some degree – interesting to study more closely to see the implications it has on procurements. Therefore, we suggest the supply side and the relationship between supply and demand sides as areas of further research to complement our model as well as our insights.

Further, it would have been preferable not only to interview people who have been part of procurements, but also take part of and study ongoing procurements at the hospitals to gain a truly objective view, as interviewees always explain things from their own perspective (Yin 1994). Desirable would also be to conduct this study on cases not chosen through convenience sampling, but rather ensure cooperation in advance with hospitals to secure that each case is representative in them having both similar and dissimilar features to enhance the quality of the findings. Our initial focus to study emergency units, and not the BDP of the hospital in general, could have been made possible by ensuring cooperation in advance with key persons. However, this was not feasible due to the time scope of this thesis, why it is suggested for further research. Also, a more quantitative approach could be used along with studying a larger number of cases to enhance the robustness. However, due to the depth we aimed to achieve in our analysis, a case study was more suitable.

Regarding theory applied, we reflect upon the fact that it does not seem to be a model that connects our three studied variables. Our variables are often present in the same models, but the relationship between them is not studied further. Such a model would have been desirable for our study since the interconnecting patterns in our results would then have been possible to explain more theoretically.

Our study being a snapshot of the buying situation, mapping current buying behavior, does not take into account future development of the medical device market, which would clearly enhance the value of the suggested strategic implications for suppliers. This due to the long time span between procurements, why extensive development – both on the market and within the hospitals – will occur, and thereby future projections become important. However, the future changes cannot be discovered or analyzed if there does not exist thorough knowledge of the current situation, why this study – in adding knowledge of the hospital buying of technically complex products of today – has contributed to laying the foundation for such a study to be built upon in the future.

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Clinician A, 2011-04-28

Clinician B, 2011-04-21

Clinician C, 2011-04-14

Purchaser A, 2011-03-29

Purchaser B, 2011-03-31

Purchaser C, 2011-04-05

Technician A, 2011-04-15

Technician B, 2011-05-06

Technician C, 2011-04-14

Pilot Study Interviews

Clinician D, 2011-03-25

Technician D, 2011-03-26

Appendix 1 - Glossary

The buying center refers to the group of employees or other members of an organization that are involved in making the purchase decision.

BDP - The buying decision process is the decision-making process undertaken by individuals in an organization before, during and after a purchase.

Commercial terms refer to conditions in the specifications document that will apply during the contract, such as payment and delivery terms.

DMU - The decision-making unit see **The buying center**

Funding request refers to when clinical managers file applications for funding to the county council to buy equipment to their clinical unit.

Mandatory requirements refers to the requirements set in the specifications document that suppliers have to fulfill for a bid to be considered in the procurement and can be seen as minimum requirements.

Medical technology industry refers to the market for all medical-related products except for pharmaceuticals, ranging from consumables such as latex gloves to high-tech products such as pacemakers and body scanners and is – together with pharmaceuticals and biotechnology – to the life science industry.

Negotiated procedure refers to a procedure where the contracting authority invites selected suppliers and may thereafter negotiate on the terms of the contract with one or several of them.

Open procedure refers to a procedure where the contracting authority publishes a tender notice and all suppliers may submit tenders.

Patient monitors are the medical devices that measure patients' vital physiological values, such as ECG, and keep the medical staff continuously updated of the changes in the general condition of patients through displaying the information.

Preferred requirements are criteria that are not mandatory, yet used to evaluate the economically most advantageous bid to be awarded the contract.

Restricted procedure refers to a procedure where all suppliers can apply to participate but tenders may only be submitted by suppliers that are invited to participate by the contracting authority.

Specifications document refers to the written documentation for a tender that a contracting authority or provides suppliers at the tender notice.

Tender notice refers to the communication from the contracting authority with the invitation to suppliers to participate in procurement through offering tenders.

Appendix 2 - Interview Questions

Hereby follows the interview questions asked to the employees at each hospital.

Generellt:

- Hur ofta köper ni in nya patientövervakningssystem?
- Hur köper ni in – centralt för hela sjukhuset eller decentraliserat per enhet?
- Hur köper ni in – enstaka eller många produkter åt gången?

Process:

- Hur är du involverad i inköpsprocessen? Vilka steg?
- Vilka andra steg kan du identifiera i inköpsprocessen?
- Hur får ni reda på att ni behöver köpa in nya övervakningssystem?
- Hur bestäms köpkriterierna?
- Hur går det till när ni ska utvärdera leverantörer?
- Hur går det slutliga urvalet till – hur skalar ni ner antalet leverantörer?
- Hur skulle du beskriva inköpsprocessen i termer av hur mycket tid och arbetsbörda som läggs ner på varje steg? Kan du fördela 100 %?
- Vilka är de viktigaste stegen anser du?
- Vilken typ av stöd får ni från era leverantörer vid de olika stegen? Var är de mest involverade och på vilket sätt?
- På vilket sätt skulle ni önska att era leverantörer skulle agera i de olika stegen, som de inte gör idag?
- Finns det några faktorer som avgör om en inköpsprocess blir kortare eller längre än en genomsnittlig?

Personer:

- Vem/vilka initierar inköpsprocessen?
- Vem/vilka använder produkten och är främst i kontakt med den?
- Tror du att det finns någon utanför de som är direkt inblandade i köpet som kan påverka beslutet eller kriterierna?
- Vem/vilka styr processen?
- Vem/vilka bestämmer vilken produkt som ska köpas in?
- Vem skriver på upphandlingen; gör själva köpet?
- Är det någon som är den centrala punkten i informationsflödet?
- Är det någon som har mer information än någon annan?
- Hur sker kommunikationen med andra avdelningar om flera ska köpa in liknande saker?
- Vilka sköter kommunikationen med andra avdelningar?
- Vem/vilka har den främsta kontakten med leverantörer?
- Vilka personer har fokus på det administrativa?
- Vilka personer har fokus på användningsområdet av maskinerna – patientfokus?

Kriterier:

- Vilka köpkriterier är viktigast för dig?

- Vilka köpkriterier tror du är viktiga för de andra personerna du har nämnt som är involverade i köpprocessen?
- Finns det något sätt att påverka vilka kriterier som är avgörande för köpet?
- Tror du att det är några speciella kriterier som uppkommer i och med LOU?

Appendix 3 - Description of Interviewees

Hereby follows a description of the positions of the persons interviewed. Attention should be paid to how some perspectives, such as Clinician B, consist of two interviewees whom were interviewed simultaneously.

Clinician A – Physician with responsibility for medical technology devices, male, at the Thoracic Intensive Care Unit of Hospital A.

Clinician B – The Clinical Unit Manager, female, and the Clinical Manager of the Emergency Unit, female, at Hospital B.

Clinician C – Nurse and Department Director with responsibility for medical technology devices, female, at the Heart Clinic of Hospital C.

Purchaser A – Purchasing Assistant, female, at Medical Technology at Hospital A.

Purchaser B – Purchasing Manager, female, Corporate Solicitor and Associate Director with contracting authority at Hospital B.

Purchaser C – Head responsible for purchasing, female, at Hospital C.

Technician A – Medical Technology Engineer, female, at Hospital A.

Technician B – Technician, female, at Hospital Common Services at cooperating hospital to Hospital B.

Technician C – A Medical Technology Engineer, male, and an Assisting Technician, female, at Hospital C.