



E-procurement in Dutch Healthcare

How (e-)Procurement can benefit patients of the Erasmus Medical Centre

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Abstract

The 'Ever increasing costs of healthcare' is identified as one of the main problems within the Dutch healthcare sector in a study conducted by the Dutch Ministry of Social Affairs and Employment. One of the ways to possibly lower costs is to review the way necessary goods and services are obtained. In order to make this procurement of goods as efficient (and cheap) as possible, companies are turning towards the internet and digitalization for the answer. This is where e-procurement comes into play. Amongst the promises of e-procurement are a reduction in administration, higher visibility of demand, improved market intelligence but most of all, lower costs.

In this study the procurement process of the Erasmus Medical Centre is reviewed. How does the EMC procure the supplies relevant for fulfilling their primary task of curing patients? What could be improved in this process and how will these improvements impact the patient?

In order to answer these questions literature was studied to identify relevant lessons from procurement strategies and e-procurement implementations in the past. After this preliminary study four Erasmus MC insiders were interviewed in order to get a clear view of the Erasmus Medical Centre's procurement approach.

Amongst the findings is a in depth evaluation of the three main order systems currently in use. The AutoBevo system works reasonably well, the Digital Order Form needs a full digitalization and the GHX should be critically evaluated due to a non optimal search function and lacking order information. In the field of logistics a lot could be gained by incorporating techniques already in use in many other areas (examples include the use of bar-coding in the retail sector).

The direct effect of these processes on the patient is found to be very limited. Main concern, decreasing costs, is barely noticeable by patients due to insurance companies handling the bills. Other effects that are noticeable by the patient include an increase in the use of technology in hospitals, improved informational insight and a possible decrease in the perceived 'chaos' of a hospital.

In general, everything a hospital does affects its patients. In this way each change in a hospital's procurement process that benefits the hospital, benefits its customers: the patient.

Recommendations for future research include a critical evaluation of the GHX package after implementation of the new Oracle ERP package (Project Spijker). It would also be interesting to broaden the footprint of this study and compare multiple hospitals on their respective procurement approach. A final suggestion is to study the adaptation of stock management and ordering technologies from Retail in a healthcare environment. Although the demands may vary slightly the healthcare industry could benefit tremendously from Retail's experience.

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Table of Contents

- ABSTRACT 2**

- ACKNOWLEDGEMENTS 3**

- 1. INTRODUCTION 6**
 - 1.1. Introduction..... 6
 - 1.2. Problem Statement 6
 - 1.3. Importance of Research..... 6

- 2. LITERATURE REVIEW..... 8**
 - 2.1. Introduction..... 8
 - 2.2. Definitions 8
 - 2.3. Positive and negative aspects 9
 - 2.4. Requirements and considerations 10
 - 2.5. Research model 12
 - 2.6. Chapter summary 12

- 3. RESEARCH METHODOLOGY 14**
 - 3.1. Introduction..... 14
 - 3.2. Research model 14
 - 3.3. Research Questions 14
 - 3.4. Research Details 15

- 4. CASE STUDY 16**
 - 4.1. Introduction of the Erasmus Medical Centre 16
 - 4.2. Organizational Perspective: Purchasing and Policy 18
 - 4.3. Organizational Perspective: Technology and Logistics 22
 - 4.4. User Perspective: Purchasing Department..... 25
 - 4.5. User Perspective: Medical End User..... 28

5. CASE ANALYSIS	31
5.1. Introduction.....	31
5.2. Healthcare Improvement Stratosphere	31
5.3. Progression Strategy.....	33
5.4. Impact of Developments on Patient	34
5.5. Summary	35
6. CONCLUSIONS.....	37
6.1. Introduction.....	37
6.2. Main Findings	37
6.3. Lessons Learnt	39
6.4. Research Limitations.....	40
6.5. Future Research.....	40
6.6. Thesis Conclusions	40
7. REFERENCES	42
APPENDIX A QUESTIONS FOR INTERVIEWS.....	44
APPENDIX B INTERVIEW ERIK ZWARTER	45
APPENDIX C INTERVIEW TJITZE WESTSTRATE.....	51
APPENDIX D INTERVIEW BOB HEKKING.....	55
APPENDIX E INTERVIEW RENS ZWANG	59

1. Introduction

1.1. Introduction

This chapter will start by describing the problem upon which this thesis is based. After a description of this problem the importance of doing a study based on this problem is discussed.

Main goal of this chapter is to introduce the main subject of the thesis and describe what can be gained by studying this topic.

1.2. Problem Statement

The 'Ever increasing costs of healthcare' is identified as one of the main problems within the Dutch healthcare sector in a study conducted by the Dutch Ministry of Social Affairs and Employment (SZW, 2000). According to this study the problem is of such dimensions that "no instrument should be left unused if one wants to control it". The message is clear: spending has to go down or at least stop rising at the current pace.

One of the ways to possibly lower costs is to review the way necessary goods and services are obtained. For as long as there have been companies, there has been the need for certain goods and services. This need leads to the acquisition of these goods and services, a process known as Procurement. In order to make this procurement as efficient (and cheap) as possible, companies are turning towards the internet and digitalization for the answer. This is where e-procurement comes into play. Amongst the promises of e-procurement are a reduction of administration, higher visibility of demand, improved market intelligence but most of all, lower costs (*Hawking and Stein, 2002*).

When looking at the Dutch Healthcare's use of information systems and especially e-procurement the message is mixed. *Zulfiqar et al (2002)* regards the Netherlands as a pioneer in the field of developing and implementing e-procurement solutions. But the Case Study of a (failed) Order Entry System in a Dutch University Medical Centre conducted by *Aarts et al (2004)* shows us there is still a lot to learn (and gain) by expanding our knowledge about the implementation and use of (e-)procurement systems.

The increasing costs of healthcare and the need for controlling (and ideally lowering) the expenditure is thus clear (*SZW, 2000*). The research of *Hawking and Stein (2002)* shows e-procurement as a potentially useful tool in achieving this desired control.

1.3. Importance of Research

When looking at procurement within the Healthcare industry *Federici and Resca (2005)* found that, when compared to other Public Administrations, it is necessary to consider that Healthcare differs because of the critical and specialized services it delivers. Because there are lives at stake it is necessary to maintain a constant high quality standard for a large portion of the goods and services acquired. Because of this difference, 'traditional' e-procurement research in other sectors may or may not be applicable to the healthcare industry.

There seems to be a dilemma when it comes to healthcare e-procurement. On one hand there is a clear need for cost reduction and a search for improved efficiency that pushes the healthcare

industry towards e-procurement but on the other hand the nature of the healthcare industry leads to specific demands that e-procurement may or may not be able to fulfill (*Zulfiqar et al, 2002* and *Aarts et al, 2004*).

Aim of this study is to examine the use of e-procurement within a large Dutch medical institution (the Erasmus Medical Centre) and compare the benefits and downsides of e-procurement in a Dutch healthcare environment with research on this field done in the past. This study aims at suggesting possible improvements to the current approach and will try to map the path towards a fully e-procurement-enabled healthcare institution.

2. Literature Review

2.1. Introduction

This chapter will begin by describing the definition of (e-) procurement. The chapter will continue with an overview of the possible positive and negative aspects of the implementation and use of an e-procurement solution/strategy. After this overview the requirements and considerations for successful e-procurement implementation and use will be handled.

Main goal of this chapter is to introduce/clarify the main concepts and underline the potential of a successful procurement solution while creating awareness of the risks.

2.2. Definitions

In a study conducted by the Aberdeen Group (*Minahan and Degan, 2001*) e-procurement activities are divided into three parts. These parts are transformed into their healthcare equivalents in the table below (see [Table 1 Division of e-procurement activities](#)) to clarify their definitions:

	Aberdeen Definition¹	'Healthcare' e-procurement examples
Indirect Procurement	<i>"The selection, purchase and management of non-production goods and services –from basic office supplies to complex business services"</i>	<ul style="list-style-type: none"> • Office supplies • A cleaning company to clean the facilities
Direct Procurement	<i>"The organization, planning and management of procurement and supply chain activities associated with acquiring the raw materials, parts and assemblies necessary to manufacture finished products"</i>	<ul style="list-style-type: none"> • Surgical equipment (bandages, scissors, knives) • Medication • Laboratory tests within a/between hospital(s)
Sourcing	<i>"The identification, evaluation, negotiation and configuration of products, services and suppliers for both indirect and direct materials supply chains"</i>	<ul style="list-style-type: none"> • Attending seminars to learn about new kinds of medication • Comparing pharmacies on their ability to deliver medication

Table 1 Division of e-procurement activities

Federici and Resca (2005) state that e-procurement can be viewed in two different perspectives.

1. **Narrow perspective**, the acquisition of certain goods. In this perspective e-procurement is simply a group of electronic tools that connect buyers and suppliers.
2. **Broad perspective**, the whole process of acquisition. In this perspective e-procurement is a process that begins with the need for a certain product and ends with its use (including all steps in-between).

Indirect procurement in Healthcare does not differ that much from indirect procurement in any other sector. There is however a difference between direct procurement in the healthcare sector and direct procurement in other public sectors. According to *Federici and Resca (2005)* healthcare's critical and specialized services forces the sector to value the quality standard of the procured goods and services very high when compared to other sectors. This difference in priorities of direct

¹ Definitions are copied from the Aberdeen report

procurement is where the healthcare sector differs from other public sectors thus experience from these other sectors may or may not be applicable on the healthcare sector. In this study the focus will lie on the Direct Procurement of the Erasmus Medical Centre, viewed from a broad perspective.

2.3. Positive and negative aspects

There has been a lot of research on the positive and negative aspects of e-procurement (*Minahan and Degan (2001), Hawking and Stein (2002)*). The following benefits and drawbacks are summarized results from these studies. The mentioned benefits and drawbacks can be seen as the results of a organizational change from a 'traditional', paper-based, procurement solution to a 'modern', computer-based, e-procurement system.

The possible benefits can be categorized into several focuses:

1. Cost focus

- *Reduced administration, operation and inventory costs.* Thanks to less paperwork, more automation in the procurement process and improved order-cycle times the ordering, storing and administration costs could be lowered.
- *Negotiated unit cost reduction.* Larger companies usually have carefully negotiated contracts to ensure the lowest purchase price for their inventory. These contracts could include discounts when obeying the terms of the contracts (for example a certain minimum of orders with a supplier). If there is a better overview of the orders made this could improve the companies negotiating position and possibly lower purchase prices.
- *Eliminating maverick buying.* Reducing the opportunities for employees to buy inventory 'outside' the aforementioned contracts could be reduced by implementing e-procurement which in turn could lower purchase costs.
- *Sales price reduction.* Because of the cost reduction mentioned at *a*, *b* and *c* the sales price could be lowered which could result in improved sales and possibly a higher turnover.

2. Strategic focus

- *Improved visibility of customer demand.* The use of a e-procurement solution may lead to a better understanding of the customers wishes and demands.
- *Improved market intelligence.* The use of e-procurement could lead to a improved insight into purchasing trends (for example rising purchasing prices) which could be projected onto the market and enhance market intelligence.
- *Enhanced decision making.* The two points mentioned at *a* and *b* improve the insight of a company and thus could lead to better informed decisions.

3. Supplier relationship focus

- *Improved Contract compliance.* A better overview of spending and orders could improve a company's possibilities to honour contract terms.
- *Improved visibility of supply chain management.* Digitally monitoring of the purchasing process improves insight into the supply chain and could benefit management.

4. Internal organizational focus

- *Shortened procurement cycle times.* Electronic communication could speed up the procurement process (when compared to, for example, ordering supplies via fax) which improves the process cycle time.

5. Enhanced internal company efficiency focus

- *Enhanced inventory management.* Digitally monitoring of inventory improves the overview and could enhance the company's ability to manage this inventory.
- *Increased accuracy of production capacity.* Automation and digitalization could reduce the error rate and improve the accuracy of production capacity estimations.

Reducing costs is perceived as the most important benefit of the use of a e-procurement system according to the subjects of *Hawking and Stein's (2002)* study. There is however no guarantee that implementing a e-procurement solution automatically leads to a reduction of purchasing costs and expenditures (or any of the other benefits mentioned). There are several studies indicating that although the cost aspect is considered the biggest benefit the actual direct cost reduction could be limited to non existing (*England et al, 2000*).

Drawbacks of implementing and using e-procurement could include:

1. Implementation costs and risks.

- Changing processes within a company costs time and money and involves a certain amount of risk that could lead to even more costs.

2. Technological demands and risks.

- Implementing a technology like e-procurement involves a change in the technology used within the company. This change could lead to problems like for example: Problems integrating with existing systems, Security issues, Lack of suppliers accessible through the organizations e-procurement system and/or lack of supplier investment in catalogue development.

3. Organizational demands and risks.

- Changing processes within a company in a substantial way involves great risks. The biggest risk is the project losing support which could lead to the project failing.

The subjects of *Hawking and Stein's (2002)* study indicated that they perceive the most important drawbacks of the implementation of a e-procurement system to be the technological demands and risks.

2.4. Requirements and considerations

What is specifically required of an organization in order for the implementation and use of a e-procurement strategy to be successful is a very complex problem. A great number of studies has focused on the (un)successful implementation of e-procurement in a variety of organizations (*Aarts et al (2004)*, *Zulfiqar et al (2001)*, *Chan et al (2006)*, *Davila et al (2002)* and *Somasundaram and Damsgaard (2005)*).

Although the scale and type of organizations being researched varies greatly (from local pharmacies to large multinational companies) some common considerations can be identified:

1. General considerations

- Implementation and use of a procurement system is both a technical and a social process and impacts every aspect of an organization. In order for it to be successful both aspects have to be addressed.
- The consequences of the proposed change on the (medical) work processes have to be considered before implementing.
- Besides the actual benefits and risks, the perceived benefits and risks are of great influence on the speed of the adoption of new technology.
- Organizations are willing to adopt e-procurement for their indirect goods but are more reluctant about using e-procurement to handle their direct goods procurement.

2. Technical considerations

- During the implementation of a new information system there are continuous technical challenges that need to be addressed. Besides the technical challenges there has to be ample time spend on improving the comfort of use. The system should be user friendly or there is a significant risk that it will not be used.

3. Social considerations

- Besides a technical infrastructure there is a need for a clear coordinating mechanism and common understanding within the organization.
- It is very important for higher management to actively support the change.
- Information Technology implementation should always be seen as a process of organizational change and should be oriented towards a redesign of professional working patterns.

Using these considerations a list of requirements can be distilled that give a simplified answer to the question *what is needed for the successful implementation and use of a e-procurement system?*

1. Technological requirements

- 1.1. Adequate technological Infrastructure
- 1.2. Adequate technological Infrastructure of business partners
- 1.3. Integration with business partners
- 1.4. Possible security issues have to be handled (firewalls, back-up servers, etc.)

2. Organizational/Strategical requirements

- 2.1. Need for skilled personnel (new personnel or training of current employees)
- 2.2. The company culture, (upper) management and end-users have to be actively involved and must support the change.
- 2.3. Business Processes must (be reengineered to) support e-procurement.
- 2.4. Regulatory and Legal Controls need to support e-procurement.

2.5. Research model

Using the information from the literature a 'requirements-benefits' model (See [Figure 1 The 'Requirements-Benefits' Model](#)) is created that can be used to evaluate an organization's e-procurement approach and if this is non-existent the organization's e-procurement potential.

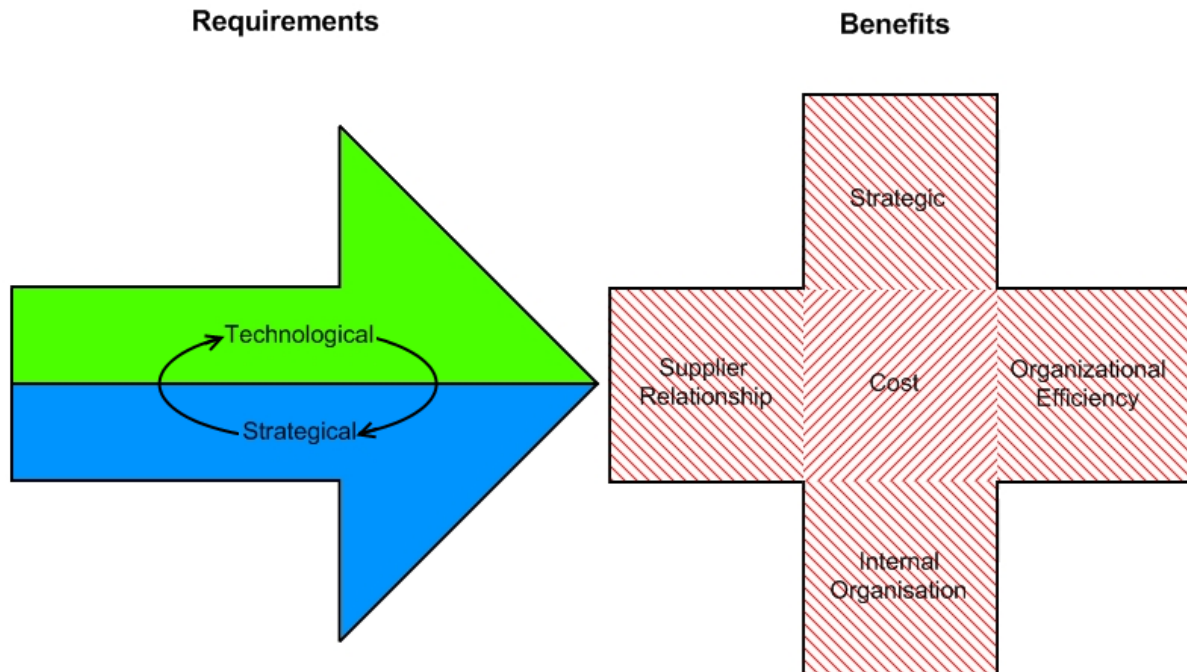


Figure 1 The 'Requirements-Benefits' Model

The model first identifies the requirements that need to be fulfilled in order for the implementation and use of e-procurement to be successful. These requirements are divided into two fields as can be seen in the 'requirements-cross'. Both of these fields influence each other. If the organization complies their specific requirements (these could differ per organization) the possible benefits are identified, divided into the five 'fields' found in the 'benefits-cross'. Using this model the steps to be taken and the benefits that can be achieved by using e-procurement are visualized.

2.6. Chapter summary

This study's focus will be on Direct Procurement which is defined as: "The organization, planning and management of procurement and supply chain activities associated with acquiring the raw materials, parts and assemblies necessary to manufacture finished products".

The biggest advantage of the implementation and use of e-procurement is perceived to be the costs reduction. Other important positive aspects include improved market intelligence, better contract compliance and shortened cycle times. Among the negative aspects the technical challenges are perceived to be the biggest. Besides these technical aspect there are also certain financial (implementation and maintenance) and organizational demands and risks.

In order for implementation and use of e-procurement to be successful, certain requirements have to be met. These can be divided into technical requirements (infrastructure, integration) and

organizational requirements (skilled personnel, management support, business process reengineering).

Using the information from literature the 'Requirements-Benefits' model is created that will be used to evaluate the Erasmus MC's e-procurement approach.

3. Research Methodology

3.1. Introduction

This chapter starts by briefly discussing the positive and negative effects and the requirements for the successful implementation and use of e-procurement. The chapter continues to discuss the thesis main and sub research questions. The chapter concludes by handling the research details including the design of the research and the nature of the research results.

3.2. Research model

According to the Dutch Ministry of Social Affairs and Employment (SZW, 2000) the main problem with Dutch healthcare are the rising costs in general and more specifically the growth in the costs of medication. Because of this, this study will focus on the direct procurement and sourcing strategy of the Erasmus MC.

When looking at the positive aspects attributed to e-procurement in previous research the most important advantage is the possible cost reduction that comes from a well-structured procurement strategy. Reducing maverick buying, combining orders and the reduction of management and administration costs are some of the advantages that enable e-procurement to lower costs. Other non-cost related advantages include the time saved due to automating orders and improved overview of the organizations procurement.(Chan et al, 2006 and Hawking and Stein, 2002)

When looking at the requirements for a successful e-procurement strategy and implementation several studies indicate how important it is to understand that implementation is both a technical as well as a social process (Aarts et al, 2004 and Chan et al, 2006). There is a need for top management support, user training, business Process Reengineering and change management in order for the implementation (and continued use) of the e-procurement strategy to succeed. The case study conducted by Aarts et al (2004) shows that even if all of these are present implementation is still a highly unpredictable process so there is *no simple formula for success*.

This study will use past studies and literature as a tool to evaluate the current (direct) procurement and sourcing strategy implemented by the institution and to suggest possible improvements.

3.3. Research Questions

The main goal this study aims to achieve is to find out how e-procurement can benefit healthcare institutions in the Netherlands. This will be researched by studying previous research in this field, evaluating the current situation at the Erasmus Medical Centre and comparing both to identify possible improvements. The main research question is: *How can e-procurement benefit patients of the Erasmus Medical Centre?*

To answer this question the following sub-questions have been formulated:

1. *What are relevant (e-)procurement lessons from past experience?*
2. *What is the current state of Erasmus Medical Centre's procurement policy/approach?*
3. *What should be the organization's procurement strategy?*

3.4. Research Details

3.4.1. Research Design

This study will be a formal case study aimed at answering the aforementioned research question(s). The unit of analysis are the people within the Erasmus Medical Centre who come in contact with the institution's procurement strategy. This contact varies from being a end-user (a employee ordering supplies) to being a policy advisor (responsible for the functional design of the ERP package) or a purchasing account manager (responsible for orders within your domain). The key characteristic this study distinguishes its interviewee's on is the persons 'link' with the institutions procurement strategy (end-user, staff employee, etc.). Each of these people has his/her own experience and each has different demands but in order for a procurement strategy to be successful, all of their needs should be fulfilled.

The topical scope of the research project will be the Erasmus Medical Centre.

The data will be collected using in depth personal interviews. The interviews will be semi-structured (using a standard list of open questions and if needed follow-up questions). The advantage of this method is that by using follow up questions the information obtained in the interviews will be more precise. If a person doesn't give relevant information the interviewer is able to ask additional questions and obtain more and better quality information. A negative aspect of this method is that it is time consuming but because of the limited number of interviews this will not be a problem.

To get a broader view the interviewees will be divided into two 'sides', each with their own experience and views: Organizational Side and User Side.

3.4.2. Nature of Results

The type of data that will be obtained during this study will consist of a evaluation of the Erasmus Medical Centre's procurement approach. This evaluation will be constructed using the experiences and opinions voiced in the in depth interviews and a range of secondary data sources (literature and previous studies).

The aim of this study is to come up with recommendations to improve the Erasmus Medical Centre's procurement strategy and enable a more efficient and cheaper procurement approach.

4. Case Study

4.1. Introduction of the Erasmus Medical Centre

4.1.1. Brief history

In the year 1840 the build of the 'Coolsingel Hospital' was issued and construction started on Rotterdam's first Hospital. During the second world war, at the end of 1940, the 'Coolsingel Hospital' lay in ruins after being bombed and the search for a new location commenced. After ample search the new location 'Hoboken' was found and construction started.

At the end of 1961 the 'Dijkzigt Hospital' was completed but during the following years it became apparent that there was a need for a 'academic' hospital. After a thorough conversion the new 'academic hospital' opened its doors in 1967 and following a fusion with Holland's oldest children hospital, the 'Sophia Children's Hospital', the 'Academic Hospital Rotterdam' was founded in 1971. The third party to join the Academic Hospital was the renowned oncological clinic 'Daniel den Hoed' in 1995.



Figure 2 The Erasmus Medical Centre (Picture: Erwyn van der Meer)

During 1998 the dean of the medical faculty and the boards of the Erasmus University Rotterdam and Academic Hospital Rotterdam reached an agreement and the 'Erasmus University Medical Centre Rotterdam'(short 'Erasmus MC') was founded (See [Figure 2 The Erasmus Medical Centre](#)).

4.1.2. Current State

With a total of 1.320 beds, 30 operating rooms, over 10.000 employees, more than 35.000 admissions and over 300.000 'nursing days' per year the Erasmus MC is one of the largest medical facilities in the Netherlands.

The organization (See [Figure 3 Organizational Structure of the Erasmus Medical Centre](#), source: *Erasmus MC, Maatschappelijk Verslag 2008*) is structured around 67 departments, each department is managed by a department head. The organization is divided into 17 medical and research Clusters which are managed by 'Cluster Boards' and seven 'Staff Executive Boards' which handle (among others) finances, housing and facilities and personnel. The whole organization is managed by a Board of Directors.

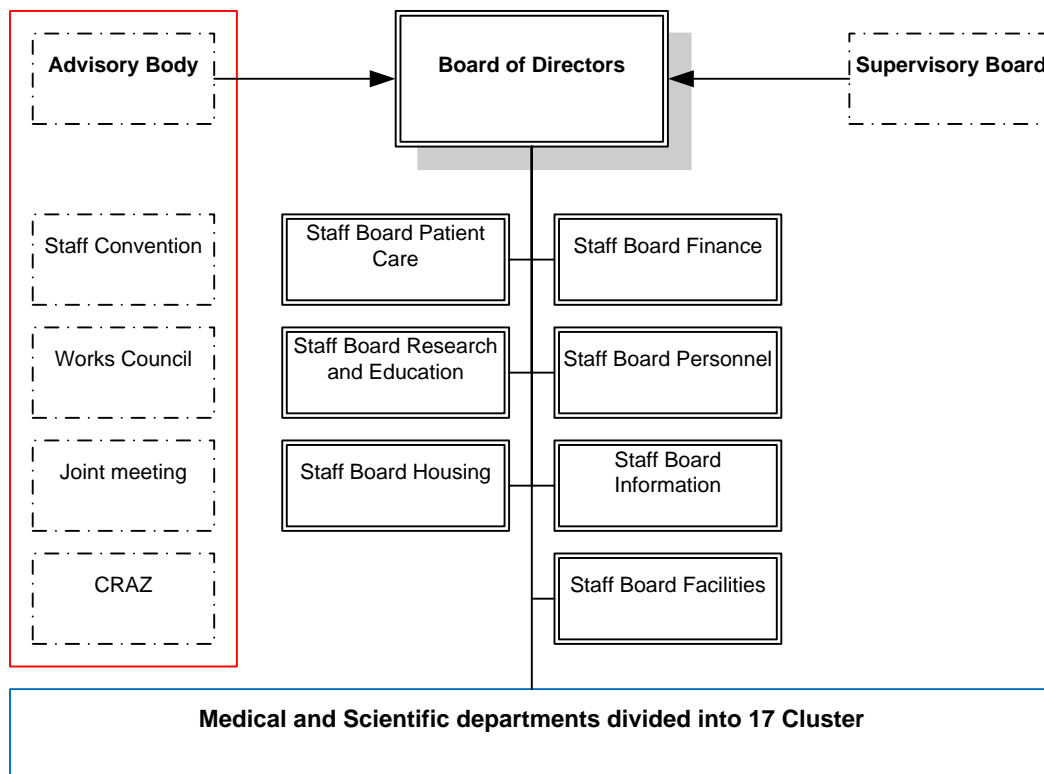


Figure 3 Organizational Structure of the Erasmus Medical Centre

Besides these facts and figures there are also the 'Procurement numbers' (*Zwarter presentation*) which are equally impressive: In 2004 the Erasmus Medical centre had a purchasing volume of 261 million euro. There was a constant onsite stock worth 1,5 million euro's of 2.500 types of products and a transit stock of over 37.000 types of products. These products were obtained from 4.500 suppliers (where 6% of the suppliers handled 80% of the volume). The logistics are mostly handled by the main Distribution Centre in Barendrecht (just outside of Rotterdam) from which the products are delivered to the hospitals departmental stock rooms.

4.2. Organizational Perspective: Purchasing and Policy

4.2.1. Introduction

Tjitze Weststrate has been working for the purchasing department of the Erasmus MC for four years. Two years before graduating in Business Administration he started as a staff member at the purchasing Department. His main task as a staff employee was to analyze the processes and procedures of the purchasing process within the Erasmus MC and to find ways to improve them. After graduating he stayed on as a staff employee until he recently became Policy Advisor Purchasing in the domain Purchasing and Logistics.

The current main project of the purchasing department is project 'Spijker', the implementation of a new Oracle ERP system at the Erasmus MC. Within this project mister Weststrate is the domain responsible controller for the logistical part of the ERP package. His main responsibility as a domain responsible controller is the functional design of the logistical part of the Oracle system, accurately reproducing the current purchasing processes within the new system.

4.2.2. Purchasing Mechanism

Procurement within the Erasmus Medical Centre can be divided into two main categories (see [Figure 4 The order processes within the Erasmus MC](#)).

The first category (left square in figure 4) are the goods that need to be on supply within the departments. These are goods with high throughput, examples include disposables (needles, bandages, catheters, etc.). These goods are stored in the departmental storage rooms and automatically supplied using the AutoBevo (Automatic Supplying) system. The AutoBevo system works with small cards with barcodes on them. As soon as a supply runs out, the card belong to the product is removed from the shelf en placed on a 'products to order' wall. These walls are scanned regularly and this information is digitally gathered and then physically faxed to the distribution centre (DC) in Barendrecht.

The second category (right square in figure 4) are the Transito supplies. These can be specialty goods (a specific implant or medical device) or 'regular' goods where there's not enough storage space in the AutoBevo departmental storage. These kind of goods can be ordered using one of two ways

- a. GHX ordering system, a Amazon.com like 'shop' were goods can be purchased of suppliers who have an contract with the Erasmus MC. Transito goods are ordered via the BIL (order information point logistics) department and delivered to the CL (Delivery Address of the hospital). From the CL the products get delivered to the department/person who placed the order.
- b. Electronic order form, this is a standardized form that can be filled out (type of product, supplier, price, etc.) and send to the Purchasing/BIL department, goods are delivered to the CL, gathered and delivered within the hospital.

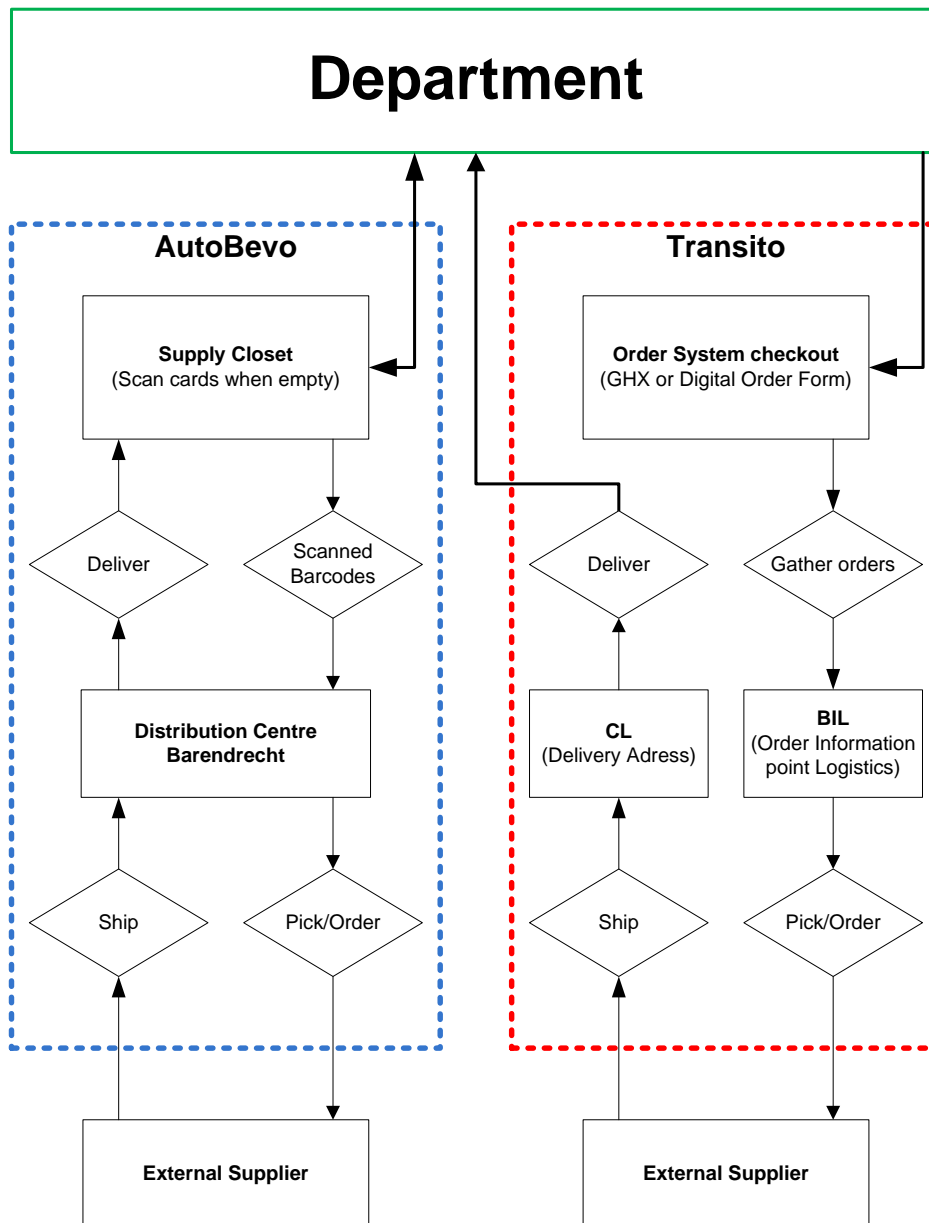


Figure 4 The order processes within the Erasmus MC

Purchasing Pattern

Procurement within the Erasmus Medical Centre is organized with decentralized purchasing and centralized control. This means that mandated employees have a spending limit of €20.000 (€50.000 for investments, this amount can vary per department) for which they can order goods. Throughout the Erasmus Medical Centre there are approximately 300 people with this purchasing right. This decentralized process is centrally monitored and controlled.

In mister Weststrate's opinion e-procurement is a tool for ordering supplies. When looking at the e-procurement as fully digitalized processes it is Weststrate's opinion that the 'degree' of e-procurement within the Erasmus MC is virtually zero. There are electronic systems in place to handle orders but there is no 'fancy' functionality (internet access to data) to support the organizational processes further than the pure basics.

4.2.3. Points of Improvement

Software

The current GHX order system is flawed, among the errors described by Weststrate is that the system is not very user friendly, there is no adequate file management and there is no decent search functionality.

One of the aspects where much can be gained is the integration of functionality. In the current situation there are a lot of different systems, each with their own specific tasks, if these were to (partially) be combined it could benefit the organization.

In the current system there are not enough possibilities in the area of user management. It would be a great improvement to be able to specify the individual rights for each user. If this could be managed in more detail it would benefit both the user and the controlling side of the organization. The user would have a limited amount of options from which to chose which would speed up the selection process and the controlling side should not have to worry about users ordering supplies they are not entitled to.

A large part of the problems mentioned before will be handled by the new Oracle ERP system (Project Spijker). The first release of this package will be delivered September 2009 and the final version will go live from the first of January 2010. Final goal of the system is to provide a portal and service functionality. This means that a large part (ideally all) of the systems in use within the hospital are integrated. Practically this means that a user can log in to a PC anywhere in the hospital and get control of their own information, programs and (order)possibilities.

Communication

Much can be gained from the possibility to communicate digitally with suppliers. Current communication is mostly done by fax which can be inefficient. Orders and invoices could for example be send via e-mail which would save a lot of time.

The second aspect where in Weststrate's opinion most can be gained is the billing process. In the current situation over 55% of the invoices received by the hospital do not have a order number. This means that someone has to manually check them, find out who they belong and who has to pay for them. In a simple case there is only one party who ordered the product and they also need to pay it. In a more complex case there is a group of people/departments who placed the order so a large number of autographs have to be collected before the invoice can be paid.

Logistics

The logistical part can be improved in two ways. The first is speeding up the handling of information. The second is to improved the insight/overview. Because of the structure of the organization (decentralized purchasing, centralized control) it is very difficult for both parties to have a good insight/overview. Information like how much stock there is left (useful for the ordering party) and what it is worth (useful for the controlling side) is very hard to collect because in a lot of cases it still has to be done by hand.

4.2.4. The Effect of Improvements on the Patient

In Weststrate's opinion the direct influence of e-procurement on the patient is minimal. When you look at a program like project Spijker which is aimed at improving the procurement process within a

hospital the largest effect will be on the organizational side of the hospital. If this part is fulfilled the medical processes can be updated and all of this combined will only have an indirect effect on patients. These indirect effects can be summarized in two fields.

One of two aspects patients could notice is the increase in technology used within the hospital. An example is the use of a medical bracelet which contains besides just a printed name a barcode with information like blood type, allergies, etc. Before administering a medicine the nurse could scan this bracelet and the medication in order to register which products are used on which patient.

The second aspect patients could and insurance companies will definitely notice is a possible decrease in cost. When this whole process is improved the time and manpower needed could shrink which would positively influence costs.

4.3. Organizational Perspective: Technology and Logistics

4.3.1. Introduction

As a project manager Erik Zwarter has a broad experience. His current projects vary from moving departments till the implementation of a new software system. Main focus in this task is to support the process change within departments (for example optimizing the blood transfusion chain, from donor to user). This is a important process with a lot of risk, mister Zwarter's task is to improve this process using tools like barcode scanning.

Focus of his function is supporting both the technical as well as the organizational change. Five years ago he transferred from the food and retail to the healthcare sector. Within the Food and Retail industry his experience with e-procurements stems from his work for companies who were doing business with Albert Heijn (AH, Dutch chain of super markets). His main task was to help them meet the demands Albert Heijn had for their suppliers. Examples of these demands include a certain type of barcode on the products, the ability to receive electronic orders, to send digital package slips and to issue a digital invoice to Albert Heijn within 24 hours.

The first thing mister Zwarter noticed when starting to work in a healthcare environment was that most orders are still done by fax. Coming from the retail industry this was a very surprising experience.

The second thing was that hospitals are very individually oriented when compared to (for example) a Albert Heijn. Where Albert Heijn has hundreds of branches whom all are centrally governed there are dozens of hospitals but all of them use their own IT and Information System. There is (hardly) any cooperation and sharing of experience.

4.3.2. Current State of Procurement

A important reason to change the current system is to reduce medical errors. The death toll estimated to be claimed by contra medication is approximately 1700 people annually.

Another important reason is to improve stock management. The current method of managing stock is mostly done by hand. Expensive equipment and implants (sometimes worth thousands of euro's) is till visually and manually counted and managed. This method is very prone to errors, for example wrongful identification, and especially sensitive for medical supplies passing their expiration date.

Because of the decreasing budgets in the healthcare sector there is a clear need for increased efficiency and decreased (stock) management costs. Counting a inventory by hand is expensive, letting implants expire is even more expensive and both of these situation can be prevented by a solid system to manage the hospital's stock.

The final reason to change is that in mister Zwarter's opinion there is a clear misalignment between hospital IT and hospital requirements. Healthcare is a environment that is very dependent on speed and correctness of information and if the current systems cannot deliver they need to be replaced with something that can.

Mister Zwarter feels that he is not alone in this perception, his experience is that people working in the healthcare want these changes rather today than tomorrow. "Say I were to create a device that enables nurses to scan blood sacks, scan the patient ID bracelet and tell them if they match in order

to prevent mistakes. This package would practically be torn out of my hands and be in use within the hour. Nurses know the risks, they know what happens when faults are made so they would applaud the use of such a system”.

4.3.3. Progression in Procurement

One of the most pressing issues according to Zwartter is the hospital's (in the general sense, not just Erasmus MC) unawareness of the existence of techniques used in for example the retail industry. “For almost 21 years a can of carrots worth 45 cents has a standardized barcode but hospital's still re-label everything themselves using their own standard”. In Zwartter's opinion hospitals would benefit enormously from the use of standards and techniques common use in a modern retail company (especially bar-coding).

There are initiatives (like the GS1 foundation) which aim at improving the awareness of barcodes. Hospitals are a (limited) part of this GS1 foundation but the transition is low and its use in practice is still very limited.

This does not mean that this situation is bad for all. Companies like GHX prey on this kind of chaos and earn a lot of money taking this whole process out of the hospital's hands and offering them a carefree solution.

4.3.4. Barriers

The main barrier in this progression is the lack of direction. Main question in this field is: who needs to be directing this awareness and standardization debate? The government has stated that they will not act as a regulator in this case. Mister Zwartter finds this very odd because of their clear and deep involvement in other issues like for example counterfeit medication. This could be because the public's perception of the negative results (deaths) stemming from counterfeit medication outweigh those of incorrect inventory management resulting in contra medication (prescribing incorrect medication).

One of mister Zwartter's current activities is trying to get a directing organization of the ground via the NFUH (Dutch Federation of University Hospitals). This means finding people within this organization who have a clear vision of what needs to be done and are in a position to act on this vision. Main problem with this quest is that it takes a lot of time to find the right people and getting them permission to cooperate can be difficult. Reason for this is that hospitals will not benefit in the short (less than a year) term of this directing organization, it will take time to issue and implement that necessary standards.

4.3.5. Stimulus

According to mister Zwartter the first thing that is needed are (Inter) national standards. There is a large variety in systems in use and in order to exchange information all of these systems need to speak the same language. A example of a standard that needs to be set is the information that is stored on a patient ID bracelet, do you want just the name and patient number or also blood type, age, allergies, etc.?

A solution to this need for standardization is to get the insurance companies involved. In France there is a law stating that a hospital only gets its costs refunded if they can state which supply is used on which patient. This means that French hospitals need to have a decent system to link the two,

which requires national standardization. In mister Zwartter's opinion the Dutch insurance companies could benefit greatly from a more active approach.

Mister Zwartter states that the knowledge is no limiting factor in this debate. The knowledge is already out there but solutions need to come from inside. The main problem is the attitude. Medical personnel will spend millions of euro's on a MRI machine but they refuse to spend a small part of that amount on the processes (supplies) that keep this MRI machine running.

The healthcare attitude towards IT is that people wait till the final expiration date, when their software is on the brink of not being serviced anymore, till they feel the need to change.

4.3.6. Impact of Change on Patient

The effects of proper e-procurement (lesser manpower, increased efficiency and thus lower costs) will, in mister Zwartter's point of view, not be primarily noticed by patient. The insurance companies handle the expenses and most of the technical applications take place behind the scenes.

What will be noticed is a reduction of 'chaos'. Because it could be much easier to, for example, track supplies, the number of surgeries postponed due to a lack/misplacement of equipment will be lowered which will directly benefit the patient.

4.4. User Perspective: Purchasing Department

4.4.1. Introduction

After studying Logistics and Economy at the 'Hogeschool Rotterdam' Bob Hekking graduated in the field of Purchasing. Mister Hekking started at the Erasmus MC as an Operational Purchaser, responsible for the functional management of the GHX software used to orders supplies within the Erasmus MC.

A few years ago the purchasing function and the management of the purchasing software was split into different departments and a few months ago mister Hekking transferred from the functional management side to the purchasing department and became a purchasing account manager.

The reason for this split was the need to differentiate between the policy and the operational part of procurement. Currently the department is busy with the preparations for the new Oracle ERP system.

4.4.2. Structure

The purchasing department is divided into three teams, each consisting of a junior and senior account manager (see [Figure 5 The structure of the purchasing department](#)). The suppliers are divided amongst these three times using the rule that the team with the highest gross turnover with a supplier handles its supplier management.

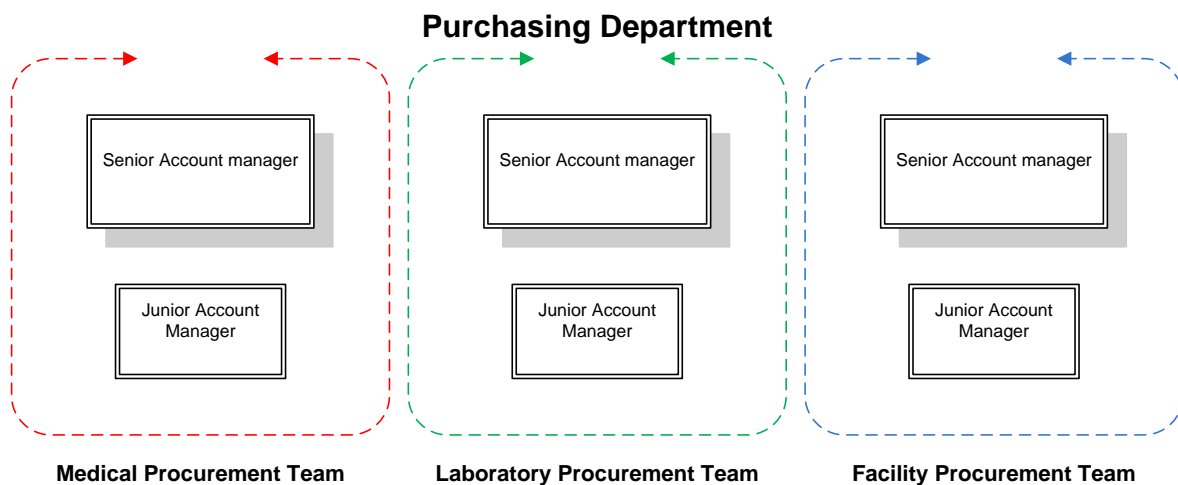


Figure 5 The structure of the purchasing department

4.4.3. Procedure

Mister Hekking states that one of the biggest problems with the current procurement approach of the Erasmus MC is that there are a lot of different kinds of forms. When you want to order something from a supplier you need form A, when you want something that is being stored at the DC in Barendrecht you need form B, etc.

All of these forms are (physically) sent to the operational purchasing department where they are handled. This physical sending process takes a lot of time, the forms are filled out digitally but sent by fax after which they need to be copied (by hand) into the supplier specific order forms. In mister Hekking's opinion a digital solution to this situation would greatly improve efficiency and reduce errors.

Because of the large amount of time the operational purchases department has to spent on copying paper orders and filing them mister Hekking states that they cannot spent ample time on the pre- and aftercare. Reducing this paperwork could greatly improve the departments results in the field of pre-contract negotiating and after purchase service (tracking orders, ensuring satisfaction, handling complaints).

A large problem with the current situation of hundreds of people ordering their supplies themselves is that it can occur that a supplier receives a dozen small orders from the Erasmus Medical Centre. This can go up to the point that supplier start to bill shipping costs. Solution to this problem is to bundle orders before sending them to the supplier but this is impossible within the current system.

Information Handling

One of the biggest problems mister Hekking encounters in his function as account manager is the collection of information. Although the current system collects information this happens behind the scenes, a result is that when meeting a supplier, in order to collect for example the order history (amount of past orders, order prices) a huge amount of work has to be done.

A more general overview and supplier management is very difficult within the current situation. This will be one of the things that will greatly improve after the implementation of the new ERP package.

Another aspect that seems like a good idea in theory but does not work in the current practice is the comparison of products/suppliers. Because of the not optimally functioning search engine comparing products between suppliers (in order to select the best option) is very difficult. This way a lot of money could be saved.

Invoices

One of the biggest gains can be achieve in the handling of invoices. Billing is still mostly done on paper and this leads to a large amount of employee involvement. If this could be handled electronically it would save a lot of time and eventually money.

A result of electronic handling of orders and invoices would be that the insight into process would greatly improve. As a result possible malfunctions in the process could be identified much more easily and problems could be solved sooner.

4.4.4. Control Mechanism

When a new product 'enters' the Erasmus Medical Centre a file is created which contains all relevant licenses and requirements. This file is required because of the nature of the work. Some of these products may end up inside a patient so it is mandatory that all relevant precautions are being made to ensure the quality (and nowadays with counterfeit medication) authenticity of the used products.

A problem that a large hospital like Erasmus Medical Centre must cope with are the sales people, representing pharmaceutical companies, entering the hospital and introducing products to medical doctors and nurses. Although this may seem a harmless act of distributing testers to ensure new clients these products have not been approved by the hospital so they should not be used. This practice is a result of the decentralized decision/buying rights. Because medical personnel (partly) handle their own procurement they get to chose which medicine to use which makes them a target for sales people.

4.4.5. Reflection

Mister Hekking states that one of the most important part of a order system is that it should be user friendly. Most of the users of the order systems are secretaries and lower level employees. These people do not want to spend hours ordering something. If it does not work within five minutes they find another way to get what they need.

In the current situation there are a lot of employees who have 'promoted themselves' to save time. Although they do not have the authority to order goods and they should run it by their supervisor first they sign off on orders themselves to save time. This is something that will also be handled in the new ERP package because user management will be much more specific and hopefully situations like these would cease to exist.

GHX

As soon as the new system is fully functional mister Hekking expects a discussion about the use of GHX. The original plan was to keep GHX functioning. Although they take a lot of work out of the hands of the internal procurement organization their services could possibly be incorporated into the new system. This incorporation should require the Erasmus MC to set up their own, more extensive, support organization and if this is desirable is up for discussion.

Patients

The main goal of any hospital (related) organization will always be the patients wellbeing. Although patients will benefit from improvements to the current procurement approach in the long run, they will rarely benefit directly.

Most of the changes will not be noticed directly by patients. One of the improvements from a purchasing organizations point of view is for example the possibility to manage relationships with suppliers better and more efficient. This improvement will benefit everyone inside a hospital due to better and faster ordering, delivery and service at a lower price. The result of this however will mostly pass by the patient because it takes place behind the scenes and the bill goes directly to the insurance company.

The thing patients will notice in mister Hekking's eyes is that it will be easier to prevent and fix errors. Because it will be much more difficult to order outside the regulated system the quality of supplies can be better controlled and guaranteed.

4.5. User Perspective: Medical End User

4.5.1. Introduction

Rens Zwang is the unit head of the department special research and development. This department does all kinds of research and special provisions. Because of the extended range of different items the department needs for their research a lot of different supplies are ordered. The employees of the department order on a daily basis.

Mister Zwang's task within this group is to control the budget and mandate large orders. Besides this task he is the representative of the AKC (Department of Clinical Chemistry) in the 'procurement counsel' where the quality of the purchasing and procurement within the Erasmus MC is discussed.

Besides this procurement counsel he is also a member of the user group GHX where the use of GHX and its problems and complaints are being handled.

4.5.2. User Experience

Verpli

The oldest system in place at Erasmus MC is Verpli. Officially this system is not being used anymore but it is still possible to use the old Verpli order numbers within GHX. Although it is not possible to use Verpli to order supplies directly the system is still functioning and linked to the other active systems. Reason for this is that the logistical backbone of the Erasmus Medical Centre is still using Verpli as its main source for delivery addresses (these are not registered in GHX).

GHX

Mister Zwang is part of the user group GHX where the use of the GHX ordering system is being discussed. The overall feeling about GHX is that it does not function very well, users are not very happy with it. This overall feeling originates from several problems.

Main complaint is that the search functionality is very poor. When searching for a certain product in GHX the problem is that vendors use their own titles and descriptions. A certain product can for example be listed as 'sodium-oxide', 'natrium-oxide' (Dutch) or a brand-specific name. This makes searching and foremost comparing products very difficult.

Another thing missing in the search function is the possibility to search for so a called 'wildcard'. When searching for example for sodium-oxide the search term sodium alone will yield so many results the output screen cannot handle them. Which means you have to search for exactly the correct term in order to get results.

The third main complaint about searching in GHX is that there are no shipping costs or delivery times mentioned. This means that a product which may seem cheap when ordered from supplier A could be more expensive due to higher shipping costs or there is a possibility that it may not be shipped for two weeks. Both of these situations are very annoying for users of the GHX system.

Digital Order Form

The third ordering mechanism in place at Erasmus Medical Centre is the digital order form. Zwang's first impression of this form is that it has a nice layout compared to the Verpli system. Main problem with this form is that although you fill it out digitally you still need to print it and physically/fax sent it to BIL. As a result of this system there is still the possibility of mistakes being made by the people copying your printed order into the suppliers order forms, this could mean that your order would be

too late or in the worst case the wrong product or no delivery at all. A lesson learnt by mister Zwang about this process is that all digital order forms need to be signed off as 'Urgent'. If this is not the case they end up in the 'regular' pile of orders which means that it could take days for the order to be sent to the supplier.

4.5.3. Result s

The way purchasing is structured per department is as follows: Each department has a 'Head buyer' responsible for the budget and purchasing of his or her department. If needed this person can mandate people to purchase goods to a certain limit. A mandated employee is called a applicant. The current 'mandating system' forces head buyers to make a choice between actively and passively supervising the applicants. Passively supervising results in less control over spending but more free time for the head buyer. Actively supervising means practically signing off on each order yourself which results in a lot more control but a large amount of the head buyer's time spend on purchasing.

A possible solution for part of the GHX problems is creating order lists. This means searching, comparing and doing (for example) a day worth of research in order to select and create the perfect order list and using this list whenever you want to order something. This is something that could work in Mister Zwang's opinion but it takes lot of time and you always have the risk of increasing/decreasing prices or delivery times which makes your list not optimal.

As a result of these complaints a lot of users made their orders outside of GHX. One could say that this made the use of GHX a failure but mister Zwang does not fully agree with this opinion. In spite of all of its shortcomings GHX still a big improvement versus Verpli. After working with the 'old' system for twenty years mister Zwang was one of the many users who still couldn't order something new using the Verpli system. It was practically impossible to order supplies because you needed the Verpli numbers and you were dependent on the few people who memorized these order numbers.

4.5.4. Impact on Patients

Because mister Zwang works in a laboratory there is not much direct contact between staff and patients. The services the laboratory delivers affect the patient only indirectly.

A negative example of Zwang's experience with 'improvements' in procurement is an attempt of the Erasmus Medical Centre to standardize and start procuring medical gloves in bulk. Different kinds of gloves were tested, a final selection was made and after some time the best was selected. When delivery commenced the new gloves were of far less quality than the one's tested before. After a study to the nature of these changes it became clear that in the fierce bidding war the supplier of the gloves had underestimated its production costs and was suspected of moving its production facilities to another country where they were unable to produce the same quality gloves. A situation like this has a very negative effect on the patient care.

A positive experience is the large degree of standardization within the hospital. An example in this field is that the purchasing division implemented a standardization of blood transfusion tubes. In Zwang's laboratory they work a lot with these kinds of tubes and they were receiving all kinds of different tubes from departments within the hospital. After standardization the time spent on transferring blood from incompatible tubes to the standard used in the laboratory was eliminated. This had a very positive effect on the amount of time needed to run tests and thus patients could notice a decrease in waiting time.

On the subject of a solid purchasing solution it is mister Zwang's firm belief that this will save time and money but the positive effect on the patient will only be indirect. A subject that will force the Erasmus Medical Centre to be more efficient is that of the costs of services. This remains a sore subject in Zwang's opinion and will become increasingly important over the next few years.

5. Case Analysis

5.1. Introduction

This chapter bundles and analyses the collected empirical data from the separate cases. Three main topics are identified which are used as a directive.

The first two topics, 'Developments in procurement technology' and 'Developments in procurement strategy' work together and influence one another. Developments in procurement technology require a change in procurement strategy and vice versa.

The third topic is the (possible) impact of the combined developments on the patient.

5.2. Healthcare Improvement Stratosphere

5.2.1. Software

Although a clear step forward compared to the old Verpli system the two ordering systems currently in use at the Erasmus Medical Centre have their respective flaws and missing functionality. Part of these flaws will be solved and some of the desired functionality will be added in the new ERP application.

The 'regular' ordering system GHX has serious limitations when looking from the organizational point of view. The current system does not enable the organization to structure the user management in the level of detail needed. There is also a need for integration of functionality to handle the large amount of different systems currently in use.

From the users perspective GHX has a negative image, mostly due to its limits in the field of search functionality. There is also a need for easy comparison of products and increased information on delivery times and shipping costs. As a result the employee's use of GHX has been sub-optimal although this is slowly improving.

The second ordering system is the digital order form, a very useful system in theory. Although users have a reasonably positive perception of this method its biggest flaw is the fact that it is not completely digital. Although information input is digital the order has to be printed and physically sent to the purchasing department (or BIL) which seriously slows down the process. Purchasing department employees have to spend ample time copying printed order forms into supplier specific order forms which leaves considerable room for error and adds to the frustration.

Important point of discussion is the future use of GHX. Phasing out the system would mean Erasmus Medical Centre has to take over GHX functionality and support which includes setting up a much more extensive purchasing organisation. It might not be a smart move to combine these extensions with the already extensive organizational and technical changes associated with Project Spijker. The system's limitations and the user's negative perception however may require a elimination of GHX in the long run.

5.2.2. Logistics

The main desire on the logistical side of the Erasmus MC procurement process is an improvement in the quality (and level of detail) of the information available. Purchasing employees need easy access to historical order data to improve negotiations, hospital managers need a detailed insight into the

outstanding orders to ensure the presence of necessary goods and in order to improve the logistical process there is a need for up to date stock management.

Besides the provision of higher quality information a good stock management system will reduce the chance of medical errors and generally improve the quality of healthcare services. Supplies passing their expiration date for example is something that could be prevented far more easily. The collection of goods necessary to perform a medical procedure is also an example of a process that would greatly benefit from improved stock insight.

Hospitals seem unaware of the fact that these problems have been encountered (and solved) by other industries before. Mister Zwartter's experience in the retail industry has shown that the necessary technique (bar-coding and in the future possibly RFID tagging) is already out there. Although adjusting these technologies to the specific demands and limitations of the healthcare industry will not be easy, in the core there is but a very small difference between 'hospital' and 'regular' stock management.

5.2.3. Communication

In the field of communication two subfields can be appointed; Internal communication (order forms sent to the purchasing department) and External communication (supplier order forms, invoices received).

Part of the critique on Internal communication has already been handled in the Software section (see [5.2.1 Software](#)). This method of communication would be improved greatly by the actual digitalization of the digital order form. This will not be easy but it would result in a large decrease in frustration (lower number of mistakes in orders) at the user side and a big increase in productivity at the organizational side. Instead of copying printed forms into digital supplier order forms the operational purchasing department could spend its time on improving the bundling of orders (lowers costs and improves efficiency) and comparing suppliers (lowers costs and improves quality of goods).

External communication suffers greatly from the number of non-digital invoices received and the lack of order numbers attached to invoices (over 55% of received invoices has no order number). Handling these invoices requires personnel to spend a lot of time tracking down people/departments responsible for the purchase and collecting autographs before the invoice can be paid and filed.

5.2.4. Technological Barriers

When looking at the barriers holding back the development of the software packages and communication processes a large part of the frustrations and shortcomings of the current situation are being taken into account in the development and implementation of the new Oracle ERP system. However the limitations and negative user image of GHX can still be seen as a barrier after the implementation of project Spijker.

The main technological barrier holding back the logistical part of Erasmus Medical Centre's procurement process is the lack of standardization. The knowledge is already present in other types of organizations (like for example retail) but in order for a technology like bar-coding to be viable in the healthcare industry (inter)national standardization is needed.

5.3. Progression Strategy

5.3.1. Organizational Structure

Procurement within the Erasmus Medical Centre is structured using a system of decentralized procurement and centralized control.

The decentralized procurement system consists of a group of 'Head buyers', responsible for the budget and large purchases within their department. These 'Head buyers' have mandate a large group of employees to handle their own procurement needs. This means mandated employees (called applicants) can purchase up to € 20.000,- for 'regular' purchases and € 50.000,- for investments (maximum amounts vary). Besides the decentralized procurement system there is a centralized control system which controls the head buyers and maintains an overview.

The main dilemma from a head buyer's perspective is how many employees should be mandated. With a large number of applicants it is more difficult to keep an overview. A smaller amount on the other hand creates a much better overview but forces the head buyer to spend valuable time authorizing purchases.

Another result of this system is that because applicants can select their own products to use, they are easy prey for sales people turning up in departments and offering them products to test. This could result in the use of unverified/unregistered products within the hospital which poses a health risk for the employee and patient.

Although it has its weaknesses the current system seems to be the only option. In a situation where employees have to spend large amounts of time requesting authorization for 'simple' goods an over complication can lead to employees 'promoting themselves' and self-authorizing purchases. In this aspect the new Oracle implementation will be an interesting showcase. Because of the high level of user/rights management possible in a modern ERP system it will be far more difficult for an employee to 'self-promote'. As a result, after the implementation of project Spijker, a new 'mandating balance' has to be found.

5.3.2. Alignment

One of the mayor problems in healthcare is the misalignment of hospital requirements and hospital IT /Information Systems (IS). Because of the high stakes in healthcare, hospitals and hospital employees are (justly) not keen on constant change. Each change in IT/IS needs to be tested and verified thoroughly before implementing. Because of the fact that healthcare is not about monetary profit but about people's lives this cautionary attitude maybe justified. As a result however the use of information systems and technology has been vastly outdated compared to other areas. A clear example is the use of barcodes which has been standardized in the retail for over 20 years and is still not (properly) used in a modern hospital like the Erasmus Medical Centre.

When looking at project Spijker it can be seen as a much needed (partial) catch up to the ever expanding range of requirements within the Erasmus Medical Centre. But for how long? The underlying reason for lagging IT/IS in healthcare is not just the higher stakes, it is the focus of the medical staff who keep valuing IT a few steps down the ladder behind their primary focus of 'curing patients'. In one of the interviewee's words: "They (*medical personnel*) see no problem in obtaining millions worth of MRI-scanners but when it comes to the supporting systems ... needed to run the scanner it is a whole different story".

5.3.3. Direction

The lack of standardization mentioned in the Technological Barriers chapter (see [5.2.4 Technological Barriers](#)) can be attributed for the largest part to a lack of direction.

When issuing a standard method/technology to be used in hospitals it takes a huge amount of effort, time and money. A project of this magnitude thus is practically impossible to achieve as a single hospital. This means that there is a need for a centrally governing organization which takes control and develops a strategy. This governing organization is what is lacking in the Dutch healthcare system.

This governing organization can originate from (roughly) three 'sources'. The first origin could be producers/suppliers of medical supplies. Problem with this source however is that they do not benefit from a standardization, on the contrary, producers would have to adjust production facilities to comply with the new regulation which would increase the costs.

The second possible origin is the Dutch government. In many cases the government has taken on this role as a directing organization (examples include the fight on counterfeit medication and the implementation and standardization of the Electronic Patient Dossier). In the field of stock management and bar code standardization however they have decided not to interfere.

The third possible source are the hospitals themselves. Although they would gain greatly from an efficient system the priorities are arranged in such a way that this role of directing organization is not on their radar.

A possible solution to this problem (as suggested by mister Zwartier) is to incorporate the insurance regulations used in France. In France insurance companies force hospitals to register claims in much more detail. As a hospital, instead of just claiming that a patient has undergone a triple bypass (for example) they have to account for each and every disposable, medicine and other supply used. This forces hospitals to register each individual supply in the hospital and register its use on a patient. As a result the hospitals were forced to develop a stock management system that could cope with the amount of data involved with this kind of registration system. This solution seems to be the most logical one because insurance companies (and indirectly patients) would benefit most of an efficiency increase (and eventually costs decrease) in hospitals.

5.4. Impact of Developments on Patient

The impact of the developments discussed so far are ultimately to the benefit of the patient. As mister Hekking described: "The main goal of a hospital will always be the wellbeing of its patients". The positive effects of the developments can be roughly divided into three areas.

5.4.1. Costs

The first and (probably) biggest result of improvements to a hospital's procurement process will be an increase in efficiency and a decrease in costs. Better information leads to improvements in negotiations and lower prices. Better stock management leads to less products expiring thus lower inventory costs. Better order methods (forms) lead to a decrease in time spent ordering thus saving time and money. All of these examples illustrate the possible positive cost effect connected to an improvement in the procurement process.

The patients perception of this lowering of the costs however will be minimal. All of the persons interviewed stressed that the possible cost benefit will only be indirect towards the patient. Reason for this is that in the current system a patient rarely sees a hospital bill. Insurance companies handle everything so as far as costs are concerned they are the only ones who will notice any change.

Of course in the long run the total healthcare costs will rise less steeply and thus insurance costs will not have to rise as fast as they should without improvements but this is all very long term and patients will rarely notice a lower growth rate in their insurance premium.

5.4.2. Use of IT

One of the things patients could notice is the increase in the application of information technology in hospitals. A good example is the medical bracelet. With modern techniques this bracelet could contain a lot more information than just a name and patient number, information like blood type, allergies or even current medication could be placed upon a bracelet.

Application of IT could lower the perception of 'chaos' associated with hospitals. The number of charts, scans and overall paperwork could be lowered which would make a more clean and well organized impression on patients.

Most of the changes however will take place behind the scenes of a hospital. Most of the administration is handled outside of the patients view and improvements to the order process for example will rarely (if at all) be noticeable by patients. This is not necessarily a wrong thing, patients are burdened enough by medical information without the added knowledge of the processes that occur behind it.

5.4.3. Mistakes

The final development that impacts the patient is the reduction of the chance of medical mistakes. Developments lead to a better and more efficient process, this includes higher quality information and improved insight. All of these developments work together to lower the chance of an error during a medical procedure.

Connected to the reduction of the chance on a medical mistake and improved process insight is if a mistake should occur, it will be much simpler to identify and correct because of the improved information.

5.5. Summary

In this chapter the main developments in two field (procurement technology and procurement strategy) are discussed together with their effect on the patient.

The main technological developments include a critical look at the GHX and Digital order Form used in the current procurement process. The logistical process could greatly benefit from technologies (like bar coding) already in use in other fields. In the area of communication the most can be gained by fully digitalizing the order process. The technological barriers lagging these developments include a lack of standardization and direction.

The main developments in procurement strategy look at the current organizational structure and the use of mandating to enable employees to procure the supplies needed. Second part of the strategical

developments is the lack of alignment in the Dutch healthcare industry. Next the lack of direction and a possible solution to this problem is presented.

Final subject is the impact of the aforementioned developments on the patient. First the change in costs and its (lack of) affect on the patient is explained. Final topic is the increase in use of IT in healthcare and the (possible) decrease of medical mistakes thanks to this increase.

6. Conclusions

6.1. Introduction

This final chapter starts off by answering the research sub questions. The next topics will include the lessons learnt by the author while conducting this study and the limitations of this study.

The final two topics will be some suggestions for further research and the thesis conclusion on how e-procurement can benefit patients of the Erasmus Medical Centre.

6.2. Main Findings

In order to answer the main research question (*How can e-procurement benefit patients of the Erasmus Medical Centre?*) the sub questions have to be answered.

Lessons from the Past

The first sub question is: *What are relevant (e-)procurement lessons from past experience?*

When identifying relevant lessons from past experience and literature three factors can be distinguished. The first important factor are the requirements for a successful e-procurement solution/strategy.

The first type of requirements are the technical requirements. These include the need for a adequate technical infrastructure, integration with business partners and handling of possible security issues (firewalls, back up servers, etc.)

The second type of requirements are the social requirements. These include the need for skilled personnel, active (upper) management support, adaption of regulatory and legal controls and very importantly a reengineering of business process in order to support e-procurement.

Main lesson about the requirements from literature and previous research is that in order for an e-procurement strategy to be successful it is critical to satisfy both type of requirements.

The second factor are the possible positive consequences of a successful e-procurement strategy/process. Previous research suggest the main benefits include a possible decrease in costs (less administration, less maverick buying, negotiated unit costs reduced, etc.). Certain strategic advantages (improved insight). A improvement in supplier relations due to better contract compliance. Shortened procurement cycle times and an increase in company efficiency.

The final factor are the possible negative consequences, these include implementation costs and risks. The possibility of technical issues (integration, security, etc.) and the possibility of organizational issues (loss of support).

Current state of e-procurement at the Erasmus Medical Centre

The second sub question is: *What is the current state of Erasmus Medical Centre's procurement policy/approach?*

The current state of e-procurement at the Erasmus MC can be viewed from two angles. The first angle is that of the technical procurement processes.

Currently the procurement process at the Erasmus MC contains three methods of ordering goods. The first method, GHX, can be seen as the most e-procurement enabled system at the Erasmus Medical Centre. This system enables users to order supplies from their workstation without the need for physically faxing the order. Main problem of GHX is its negative image due to lacking functionality (easy comparison of goods, certain information is not displayed) and a non optimal search function.

The second procurement method is the digital order form. This could be a very useful system if it was to be fully digitalized. In the current situation order still have to be printed and physically send to the purchasing department/BIL. As a result there is still room for error (while copying the received orders into supplier order forms).

The last method is the AutoBevo (Automated Supply) method. This method 'automatically' stocks the supply cabinets on each department using a system of cards which are scanned regularly. This information is gathered and physically send to the distribution centre in Barendrecht from where the cabinets are restocked. This system is considered very effective. This system however could be improved by automating the collection and communication of the order information to the distribution centre.

At the logistical side of the procurement process a lot can be gained from the application of techniques already common use in many other industries. There is a clear need for quality information, examples include a detailed order history to enhance price negotiations and the possibility of tracking orders to discover possible bottlenecks in the logistical process. The use of bar coding as a means to improve insight and traceability during the process would benefit both the organization (possible lower prices due to better negotiations, faster solution of logistical problems) and its users (less time spend on gathering information).

The second angle is the strategical/organizational angle. From this point of view the Erasmus Medical Centre has structured its procurement using a centralized control mechanism with a decentralized distribution of purchasing power. This means that employees order their own supplies but this whole process is monitored centrally.

The fact that employee's order their own supplies has a downside in the form of salespeople targeting them and bringing unverified goods into the hospital. Another downside is the mandating dilemma. In order to have good budgetary control a departmental head buyer should mandate as few employees as possible. However in order to improve a head buyers time efficiency as much employees as possible should be mandated.

Although these two aspects make the organizational structure non perfect it is the authors believe that this is the only viable solution for a organization like the Erasmus Medical Centre. The amount of different products and the degree of specialization needed to purchase supplies in a modern healthcare (and research) facility is of such extent that centralization of direct (medical) goods is not an option.

Future Procurement Strategy

The third and last sub question is: *What should the organization's procurement strategy be?*

From a technical point of view the coming implementation of project Spijker will be a big step forward. A lot of the current issues and bottlenecks will (hopefully) be solved in this new Oracle ERP package. There are however two aspects that should be evaluated critically.

The first aspect is the future use of GHX as a ordering mechanism. In order to further improve the procurement process and user satisfaction, the negative user perception and lacking functionality are a solid basis for critical evaluation in the future.

The second aspect is the digitalization of the order forms and accumulated AutoBevo orders. These are still handled physically and the procurement process would benefit greatly from a digitalization of these two tools.

From a strategical and social point of view there should be an effort to alter the medical personnel's 'attitude' towards medical Information Systems and Technology (IS and IT). Employees have to be made aware that in order for them to fulfill their primary goal of curing patients the use of IS and IT is critical. Time and money should not just be spent on for example acquiring the latest in scanning devices but also in the technologies used to handle the processes needed to operate this expensive scanner. A example of such a technology is the standardization and improvement of the medical bracelet, this simple piece of plastic could contain much more information and thus help improve the patients pathway throughout the whole hospital process.

The possible impact of these changes on the patient are one of the aspects that should influence the hospitals procurement strategy. During this study the impact of procurement on the patient has been found to be, for the largest part, indirect. The main reason to improve procurement processes, to enhance efficiency and lower costs, will directly benefit the hospitals budget and lower the invoice sent to insurance companies. Because of the modern patients exclusion from this billing process however they will only notice this change if the insurance costs are cut and this is very unlikely. In the most plausible situation the insurance costs will not rise as fast as they could.

A part of the change patients could notice directly is the increase in efficiency, possible decrease in administration and overall reduction of the perceived 'chaos' present in a modern hospital like the Erasmus Medical Centre. The amount of charts, scans and test results could give a chaotic impression and the use of new technology could reduce this impression. A result of this chaos reduction would be the reduction of the chances on a mistake and the decrease of time needed to solve a negative situation.

6.3. Lessons Learnt

The biggest and most important lesson learnt through this study is that healthcare is lagging. Although al throughout the process people are keen to change and re-align the gap between requirements and actual use of technology there is still a lot that can be improved.

There is much to be gained by using techniques already common use in other areas but in order for this to happen some things must change.

In order for change to occur in the healthcare industry there is a large need for direction and standardization. This direction should come from an (inter)national platform because a single hospital is not equipped to set up a national standard. In some field this national directing organization is already active (for example NICTIZ in the quest for a standardized Electronic Patient Dossier) but there are much more processes which would gain from such a national governing institute.

6.4. Research Limitations

The main limitation of this study is its focus on just one medical institution, the Erasmus Medical Centre. Comparing the procurement processes of different (comparable) hospitals would benefit the quality of the results and enhance the quality of the suggestions to be made.

The second limitation is the studies 'footprint'. Because of the time limitations associated with a Bachelor's Thesis, this study could only be based upon four interviews and a selection of literature. The quality and detail of the results could be improved by incorporating for example survey's to get a better picture of what the average user thinks of the systems in use at Erasmus Medical Centre today.

6.5. Future Research

The suggestions for further research can be divided into two fields. The first one is the suggestion aimed at the Erasmus Medical Centre for further studying. In the author's opinion, after the implementation of the first part of project Spijker there should be a critical look at use of GHX. User experiences and perceptions indicate much can be gained by either demanding a change to certain functions of GHX or creating your own GHX type of application for hospital procurement.

The second field of suggestions are aimed at the more general research to improve IT/IS use in the healthcare industry. A comparative study of the Erasmus Medical Centre with other, comparable, hospitals would paint a interesting picture of the current use of technology in hospital procurement. A example topic could be the use of bar-coding in a healthcare environment. A study of this nature might convince medical people of its use.

6.6. Thesis Conclusions

The main question of this research is: *How can e-procurement benefit patients of the Erasmus Medical Centre?*

When looking at the specific positive impact of an improvement of the procurement process at the Erasmus Medical Centre one can say that for the most part these positive effects will be noticed at the organizational end of the process and only some aspects will have an direct impact on the patient.

The main reason for a company to improve their procurement process is the improvement of efficiency and lowering of costs it promises. If these positive effects actually occur is dependent on the situation but if they do occur their effect will only noticed indirectly by the patient. Insurance companies handle the bill of a hospital visit so patients will rarely notice a difference.

The other possible effects (reduction of chaos, lesser chance of mistakes, improved quality of information which could lead to lesser procedures being postponed, etc.) are noticeable by the patient.

In the more general sense everything a hospital does affects its patients. As mister Hekking said during his interview 'the main goal of each healthcare institution will always be the patients'. In this

way each change in a hospital's processes that benefits the hospital, benefits its customers: the patient.

This is clearly the case in e-procurement. Although the direct effects might be lower than one could expect, overlooking the bigger picture, Erasmus Medical Centre's organizational processes would be improved and both the hospital and its patients are to gain from this improvement.

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Appendix A Questions for interviews

Question 1: What is your experience with (e-)procurement?

Aim of question: Determine the relationship of the interviewee with procurement solutions/strategy within the Erasmus MC as well as previous employments (user, administrator, etc.)

Question 2: Can you explain the current (e-)procurement solution/practices within the Erasmus MC? What do you consider positive/negative aspects of this solution?

Aim of question: Determine what procurement solutions/strategies are used within the Erasmus MC and their positive/negative characteristics from the interviewee's perspective

Question 3: If you could suggest improvements to the (e-)procurement solution of the Erasmus MC, what would they be?

Aim of question: Determine what (practical) solutions are identified by users of the procurement solutions/strategies of the Erasmus MC.

Question 4: Do you consider (e-)procurement to be of influence on Patient Value within the Erasmus MC? To what degree?

Aim of question: Determine if there is a link between procurement and patient value in the interviewee's opinion.

Appendix B Interview Erik Zwartter

Name Interviewee: Erik Zwartter
Function: Project Manager at Erasmus MC
Location: Erasmus MC, room Hs-316

Question 1: What is your experience with (e-)procurement?

As a project manager I have a broad experience. Projects I work on vary from moving departments till software implementation. The main point I do is support a process change within departments; an example is optimizing the blood transfusion chain. This is a high risk process and my task is to improve this process using tools like barcode scanning. My function is supporting both the technical as well as the organizational change.

Five years ago I transferred from the food and retail to the healthcare sector. In the Food and Retail I worked for companies who were doing business with Albert Heijn (Dutch chain of super markets). My task was to help them meet the demands Albert Heijn has for their suppliers. These demands included a certain type of barcode on the products, the ability to receive electronic orders, to send digital package slips and to issue a digital bill to Albert Heijn within 24 hours.

Upon arriving in the Healthcare industry I was very amazed to discover that the most modern and technically sophisticated technique that was used to order supplies was a electronic fax-machine. Today still, there has not been many changes in this field. Most of the orders are still done by fax. Right now I am busy implementing a ERP system. We currently use a iSoft system that has been in use since 1975 and running reasonably stable. The whole system can be reanimated and activated using little 4GB USB sticks which has its ups and downs.

Besides the ERP implementation I am currently trying to get the GS1 code standard that has been used in the retail sector for quite some time to be implemented in hospitals. So far this is going far from smoothly. For almost 21 years every can of carrots has a standardized barcode but in hospitals we're practically re-labeling every incoming product using the hospitals own standard.

Follow up question: Why is this?

The reason for this transition to be so slow is in my opinion a lack of direction. There is no one who takes charge and simply does it. For example; if you want to know when internal mail delivers a package within the hospital it would be possible to barcode-label every office, this could be done within a few days. This whole system could be up and running within a week . With medical supplies it goes even further, most of them are already labeled using a standard G10 code but hospitals are unaware of the existence of such a barcode and hence don't use it. One of my tasks is to visit hospitals and create awareness on this fact. A month ago a team from the German television channel ARD visited us and made a documentary on the possibilities in this field and report on the steps needed In order to achieve this automated process.

Follow up question: Where should this direction come from?

The government is definitely not going to act as a regulator in this case, the IGZ (Inspection Healthcare Industry) has repeatedly stated they will not form a directing part in this. I find this very odd because of their many involvements in other fields. One of the main topics the VWS (ministry of

Health, Welfare and Sport) is handling right now is counterfeit medication. This is a hot topic right but when comparing this to errors made because of the current method of (visually) managing stock it is relatively small. The number of deaths because of wrong medication is estimated at 1700 annually but apparently the lobby of companies trying to prevent counterfeit medication is stronger than the lobby for automating stock management. I don't expect this to change, especially not in the short term.

Follow up question: Why is this transition so hard in the medical sector? You already mentioned the lack of direction but are there any other reasons?

Hospitals are reasonably individual when compared to the thousands of Albert Heijns. The AH's have a central organization which recognizes that it is becoming more and more expensive to handle all of the different suppliers and codes and standards and can centrally decide, this is going to change. Hospitals are much more individual and although they can decide, within the hospital, that things must change they are (individually) too small to make demands towards suppliers. Each hospital arranges its own procurement, IT, Information Systems, etc.

Right now I am trying to gather the people who understand in what direction we should be heading within the NFUH (Dutch Federation of University Medical Centre's). Finding these people is a long process, it is difficult to find people who do not only know where we should be heading but who are also willing to say; let's do it! There is for example is a person in Groningen who has the knowledge and wants things to change within his hospital but has this iSoft package that isn't going to change in the foreseeable 4 to 5 years. Because it takes a lot of time before the hospital reaps the benefits his boss forbids him to spend time on projects like these.

It could also be rewarding to try to get the Dutch healthcare insurance companies involved, they pay the bills and if they demand these standards hospitals have no other option than to comply. It still baffles me, as soon as someone enters a hospital they forget all experience and stop using techniques that are common sense in practically every other aspect of life.

Follow up question: Does this occur often in hospitals; new techniques being slowed down by the status quo?

Yes, in practice it does. A large variety in systems slows down change because it makes matter more difficult. iPhone (applications) for example works good because all irrelevant factors are left out (one operating system, no additional system requirements, etc.), you just press OK and it works. This is not the case in hospitals where a large number of systems work besides each other, each with their own demands and requirements. The only way to solve this problem is to set large (national/international) standards. A practical example is the way to identify patients, the information stored on a ID-bracelet has to be discussed; do you just want date of birth and blood type or do you also want known allergies and current medication? These kind of things have to be discussed and standardized.

This is not just a Dutch problem, also in other countries it is very difficult to change the status quo. These changes have to come from within, it is almost impossible to just decide, top down, this is how it is going to be from now on, this takes a lot of discussions and lobbying.

Follow up question: Would it be effective if this problem is handled on a hospital (versus national) scale?

I don't think so. I always use the following example: Before the year 1100 the Netherlands was divided into small regions, all of which had their own dialects and currency. Because there was virtually no trading this was no problem and life was running smoothly. After cultural and social developments in the 1200s there came a need for official documents and trading which gradually required an official language. The development of this official language was sped up by technological developments like the discovery of printing books. The key word in this development is exchange, as soon as there is a need to exchange information/objects a standard (currency, language, etc.) is required.

In healthcare this can be seen as for example an implant being developed in the United States and flown to the Erasmus MC to be implanted. In order for this to be successful you need a system to identify which implant is needed.

Follow up question: What do you think is the effect of the 'nature' of healthcare services on this transition?

The weird thing is that healthcare wants to change. If I for example were to create a package that enables nurses to scan blood sacks, scan the patient ID bracelet and tell them if they match in order to prevent mistakes. This package would practically be torn out of my hands and be in use within the hour. Nurses know the risks, they know what happens when faults are made so they would applaud the use of such a system. So there is a primary process on the one hand which wants to have these kind of technologies because they realize how much they could help. On the other hand they are mostly unaware of the possibilities.

Question 2: Can you explain the current (e-)procurement solution/practices within the Erasmus MC? What do you consider positive/negative aspects of this solution?

Most of the currently procured resources are ordered by fax. For a while we had a package from Johnson and Johnson but after some time this system failed and had to be replaced with a newer version. At that time a cost/benefit assessment was made and it was decided to continue using the old (fax) method.

Follow up question: If there is no digital procurement process, does this mean that every department does its own procurement?

Not completely, when looking at medical supplies (disposables for example) there is a departmental supply room where stock is maintained (a so called automatic supply chamber) automatically. This is done by cards. Each type of supply has its own card, when stock is low the card is pulled from the stock-box and hung on a special order-wall. Once every week (or few days) someone checks this wall, scans the cards and orders the supplies (in batch) that are low on stock. These supplies are centrally ordered in batches (steady amounts) but only when needed (so varying order times). The internal ordering process is done digitally but the external ordering is still done by fax. A system that is currently gaining support and used for some of our supplies (Dell computers, stationeries) is by a company called 'Market for Care/GHX'. They take this whole ordering/bar-coding process and handle all the different suppliers creating a large order catalogue thus removing the hassle for hospitals to have their own relabeling and complex order systems. They can be viewed as sort of a 'Wehkamp' for hospitals.

In 2006 Erasmus Medical Centre implemented the 'gezamenlijk inkopen (buying together)' project which won an award. This method is still being used and focuses on the hospital-wide procurement of certain supplies thus saving a lot of money and gaining a better insight.

(looking at the ARD documentary on YouTube)

The stock is managed digitally (there are digital lists of stock that are manually maintained).

Follow up question: But if stock is already managed digitally wouldn't it be a small step to a fully digitalized ordering system?

(Pointing at the iSoft system used in a operation room displayed on the screen)

This iSoft system currently used in operation rooms is very old and you wouldn't believe what we had to build around this to make it compatible with all of the other system currently used in the Erasmus Medical Centre (for example the barcode system). To make interfaces and link the iSoft system with the procurement system would involve such vast amounts of time and resources that it is not considered practical.

When I started five years ago there was a huge variety of barcodes. In the Albert Heijn you're not welcome unless you comply with their barcode standards but in hospitals there is no regulation and no one recognizes its added value. Everyone shops at Albert Heijn but he second someone enters a hospital all of this experience is forgotten for some dark reason. In the Netherlands there is also no link between this barcode system and hospital charges. In France for example all supplies must obey certain standards in order for them to be legal to use. The system in France is that your are obliged to explain for all medicine/implants/supplies on which patient they are used, if not the hospital will not get a refund from you're insurance company.

GS1 is a foundation of which we (as hospitals) are a part of. The representation of hospitals in this foundation is very limited because they don't know these techniques exist. So far these methods and techniques are a 'future toy', manufacturers still benefit from the status quo. I heard manufacturers explain that if they want to change manufacturing plants to obey standards in bar-coding it will lead to production loss of a year! So as long as hospitals don't force them to change they will not do it themselves.

Question 3: If you could suggest improvements to the (e-)procurement solution of the Erasmus MC, what would they be?

Besides barcodes I think a main action point is the whole process of (operational) procurement. In a lot of hospitals it is still common practice to count and manage stock by hand.

Follow up question: Do you see this changing in the upcoming years or do you believe this practice be hard to eradicate?

I think this will definitely change in the upcoming years. Under pressure of budgets the need for larger scale and more centralized procurement this will have to change. As long as budget aren't very tight there is still room to accept these kinds of practices.

Solutions will have to come from within hospitals. Other, external, companies already have the knowledge and capabilities but hospitals still cling to their fax machines. They have to become aware that things need to change. The software is already out there (SAP, Oracle, etc.) but the focus is clearly in their primary focus of helping patients. They see no problem in obtaining millions worth of MRI-scanners but when it comes to the supporting systems used to obtain the supplies needed to run the scanner it's a whole different story. This is the focus that needs to shift within every hospital in order for the process to run more smoothly and efficient.

Things have to go very far before people realize things have to change. In our case this became apparent when certain systems were clearly going to start failing and the end-of-service date was rapidly approaching. When a manufacturer tells you they stop supporting the system you rely on to help run your hospital (since 1975) you realize that it is time for a change. As soon as this kind of news comes out people start realizing that there is a huge gap between your business requirements and the actual services the system provides. As soon as a new system is implemented these two become better aligned but the question always remains: for how long?

The Distribution Centre started up in Barendrecht was created with the idea that it would service the greater Rotterdam Area. After a few years this DC is still only servicing the Erasmus Medical Centre because it proved to be too great a challenge to link all of the hospital backbones to this one central hub.

Besides these aspects there is a clear misalignment in healthcare between requirements and IT. There is a great need for people who can build the bridges and re-align those two aspects and who can translate the requirements to practical solutions. This is one of the main aspects lacking in current healthcare.

Question 4: Do you consider (e-)procurement to be of influence on Patient Value within the Erasmus MC? To what degree?

First of all I have to say that e-procurement could also work without standardization. Businesses like GHX even benefit from the current chaos by telling companies: 'Pay me a fee and we will handle the whole fuss of barcoding'. Even if labels are in Chinese these companies manage them by using a huge database/catalogue. This enables hospitals to scan these codes and identify the object, stated that they even have a barcode because over 20% doesn't even have a barcode. Even expensive implants (think in the regions of \$20.000) are still 'managed' visually and without digital identification. When updating stock registries doctors check shelves and visually confirm that there are, for example, three vascular prostheses (worth €15.000 each) left.

During my introduction I literally checked supply cabinets and held in my hand pacemakers who were expiring within the week. The medical doctors present didn't know this and this is the kind of situation which is common practice. In current barcodes it is possible to incorporate expiration dates so this kind of situation can be avoided. In the future SAP implementation this kind of thing is managed digitally and you could for example ask the system to provide you with a list of all of the supplies expiring within two weeks. You could for example ask suppliers to take back stock that is soon to expire but in order for this to work you need (a) a solid set of standards and (b) all of the hospitals to actually use these standards.

The efficiency benefits, the lesser amount of manpower needed to run the organization and the cost benefits linked with these changes are things a patient will not (primarily) notice. Cost reductions is a aspect that will only be noticed in the long term. Reason for this is that costs are handled by insurance companies and most of the patients don't even see the bill. Things patients will primarily notice will be the reduction of the 'chaos' on a hospital work floor. For all of the equipment there are procedures, supplies have to be decontaminated before use. In the current situation it occurs that equipment is not available on time because of poor planning and surgeries have to be postponed. These kind of situation will be reduced and this is a thing patients will surely notice.

Appendix C Interview Tjitze Weststrate

Name Interviewee: Tjitze Weststrate
Function: Policy Advisor Procurement, domain Purchasing & Logistics – Project Spijker
Location: Erasmus MC, Westzeedijk 98

Question 1: What is your experience with (e-)procurement?

My current function is that of Domain Responsible Controller. Our main project is project Spijker, the implementation of a new ERP system at the Erasmus MC. My main task in this project is the functional design of the logistical part of the Oracle system. This basically means that I am responsible for accurately reproducing the current processes within the new system.

Before this function I have been a staff employee Purchasing here at Erasmus MC for four years. My main task as a staff employee was to analyze the processes and procedures of the purchasing process within the Erasmus MC and to find ways to improve this.

I graduated from Erasmus University a little over two years ago so I have been doing this staff function for two years next to my study of Business Administration.

Question 2: Can you explain the current (e-)procurement solution/practices within the Erasmus MC? What do you consider positive/negative aspects of this solution?

First of all: e-procurement is in my opinion a tool for people who do the ordering. That's it. It could also be a tool for the strategic/tactical purchasing department to be used to negotiate prices. In my opinion e-procurement is just the possibility for a purchaser to order supplies.

Interviewer explains that in this thesis e-procurement is defined in the broad sense, the whole process from order to negotiating prices and the final delivery and billing.

When you look at e-procurement in that way the current status is practically zero. Of course we have an ERP system in place called ZIS but this is a fairly old system, DOS based and has been in place for over 38 years. The whole procurement part has not been fully digitalized, there is no internet access or other 'fancy' functionality. This means that all negotiations are still handled based on paper data instead of digital overviews. The current ERP system does gather orders but the actual ordering is mostly still done by (e-)fax or even by mail for the bigger orders.

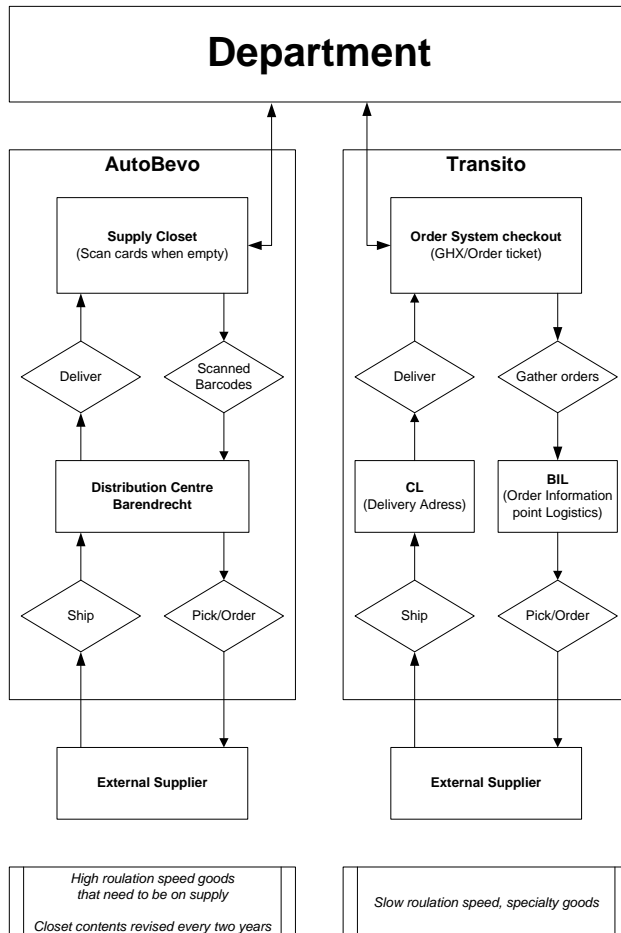
Besides the ERP system we also have a internet order platform called GHX, a sort of amazon.com for hospitals where employees can browse and order things themselves.

For purchasing we use a system of decentralized purchasing power with central coordination. This means that designated people (in the whole of Erasmus MC approximately 300 people) within departments have the power to buy supplies up to € 20.000 (€ 50.000 for long term investments) and this is centrally checked and controlled.

Follow up Question: Why this system?

Reason for this is purely practical, if all purchases will be done centrally the amount of time and resources this would take would be huge which would negatively affect performance and costs. Sometimes a department just needs something and you can't negotiate prices, you just need to buy it.

The actual purchasing process is organized as follows:



Whole process was explained verbally and draw on whiteboard, for overview purposes the image above was created by the author.

Question 3: If you could suggest improvements to the (e-)procurement solution of the Erasmus MC, what would they be?

In itself the current system works. Main negative aspects of the system are:

- Lack of user friendliness
- No decent search functionality
- Rubbish file management

Conclusion is that the system is just old, it cannot compete with the possibilities new, modern systems have.

Another reason for renewing the system is to improve the integration of functionality, instead of a lot of different systems with their own specific tasks there is one system to manage all of this functionality.

There is also the improvement of user management. In a modern system you are able to specify for each user what they can and cannot do (/buy/have access to). A person who for example works on the Clinical Genetics Department can order radioactive material and has a need for this in their work but a 'regular' nurse has no need for this kind of material so shouldn't be able to order it. In short it would be much easier to diversify within the organization.

Communicating digitally with suppliers would be another great improvement. Being able to handle business through e-mails instead of faxing back and forth. Part of this is that things like billing can be done electronically which would be a gigantic improvement. In the current situation over 55% of our incoming invoices do not have a order number attached which means that a person has to look at this invoice manually, find the people responsible, find out who has to pay and in the most negative case this invoice has to be split between ten departments which means finding ten people to sign off on the invoice. This is also one the things that will be handled in our new system.

In the logistic part of the process the most can be gained from the speeding up of information handling and the improved insight into the status within the organization. Because of the structure of our organization (centrally managed but decentralized steering) the decentralized part has very little overview and insight. Things like what is at stock, how much is it worth, where are supplies stored, etc.). This is one the main things wrong with the current system, it does not provide this kind of information, it has it but keeps it within 'the black box'.

Follow up question: What is the status of this new 'Project Spijker'? Will this handle the current problems?

The first release version of the new Oracle EBS system will be delivered coming September and the final implementation will take place starting the first of January. The implementation is split into four platforms, each platform adds functionality so you could say that each platform solves some of the problems. In the ideal final stage all problems are solved. The first platforms include the Continuity of the business, the possibilities of today have to remain present from the first of January onwards. This platform will contain most of the improvements in the field of purchasing and logistics. The following Platforms 2, 3 and 4 are also meant to deliver big improvements but these will be implemented during a later stage.

The final goal of our system is a portal and service functionality which means that a employee can log in to a computer anywhere in the hospital and get their own programs, files and possibilities for things like ordering supplies. In this way all of our different systems are integrated into one big system.

In the current situation it is the case that if you log in to a random computer (as an employee), you get your own files but this is not the case with our applications.

Question 4: Do you consider (e-)procurement to be of influence on Patient Value within the Erasmus MC? To what degree?

In my opinion the influence of our current project on the patient side is minimal. The current improvements benefit the organizational side of the hospital side. When this is done correctly the medical side can be updated which will be more noticeable for patients.

When the medical side is improved the patient will notice this in the increase of technologies used in the hospital (for example the hospital bracelet will contain beside a name a barcode containing information regarding blood type, allergies etc.). The IT side will not be so noticeable for patients because this is used behind the scenes. If everything works properly patients should receive better service.

Because the patients nowadays doesn't notice things like the bill of his hospital visit (this goes directly to the insurance company) they will not notice a decrease in costs. Patients don't care how the hospital manage their business, what ERP system they use, what systems they implemented. The patient cares about the level of care he/she receives. One of the things in that field the patient will notice is that (if all goes well) the amount of errors made will be greatly reduced because of the double-check mechanism that can be incorporated into the improved software (false/contraindication).

A patient shouldn't notice anything of the hospital's IT except the PC in his room that has a working internet connection so they can chat and surf. The rest should be our concern and not the patients..

Appendix D Interview Bob Hekking

Name Interviewee: Bob Hekking
Function: Account manager Purchasing Erasmus MC
Location: Erasmus MC 'Nieuw Hoboken', Rochussenstraat 125, Rotterdam

Question 1: What is your experience with (e-)procurement?

After my study Logistics and Economy at the 'Hogeschool Rotterdam' I graduated in the field of Purchasing. I started within the Erasmus MC as a Operational Purchaser, specialized in functional management of the GHX software used to orders supplies within the Erasmus MC.

A few years ago the purchasing function and the management of the purchasing software was split into different departments and a few months ago I transferred from the functional management side to the pure Purchasing department.

Reason for this split was the need to differentiate between the policy and the operational part of procurement.

Right now we are busy with the preparations for the new Oracle ERP system (Project Spijker).

Question 2: Can you explain the current (e-)procurement solution/practices within the Erasmus MC? What do you consider positive/negative aspects of this solution?

Purchasing is divided into three teams (Medical, Laboratory, Facility) each Team consists of a junior and senior Account manager. The team with the highest gross turnover with a supplier handles its supplier management.

Positive/negative aspects and chain specific problems are handled within the next question

Question 3: If you could suggest improvements to the (e-)procurement solution of the Erasmus MC, what would they be?

A big problem in the current situation is that you need a different kind of form for each transaction you want to take place. When ordering something from the Distribution Centre in Barendrecht you need Form A, to order something from a supplier outside the 'standard' suppliers you need form B, etc.

In our 'regular' system we have a large list of supplies, these are reasonably easy to order. As soon as you want to order something outside of this system you need a digital order form (and the signatures of the people involved/responsible). All of these regular and special orders are send to the operational purchasing department which handles them accordingly.

Besides orders there is also a 'investment', these involve quite a bit more work, they need signatures from all people involved, test have to be ordered (or carried out if not available) in order to see if the products meet the required standards.

When a new article is introduced in the hospital it has to be checked before it can be used. Reason for this is that there are lives at stake and you can't just use something without knowing where it comes from, that it has the required certificates and it meets the standards/requirements.

If this process could be handled digitally it would greatly improve the process. Our current system is very old and it is extremely difficult (if at all possible) to get the reports and overviews you want. When meeting with a supplier it takes ages to gather the required information and there is no guarantee the intelligence you get is correct.

This will be a big improvement in the new system. Oracle can easily gather and print the desired information. Besides this advantage it will also be much easier for new staff to work with because of its familiar User interface (when compared to a 30 year old DOS interface).

As soon as all of this is handled electronically the operational purchasing department gets a lot more freedom to handle things like aftercare. Right now this department is occupied with handling the flow of orders, filling out forms and sending them to suppliers. There is no time to carefully check each order (and for example search for the cheaper/better supplier). This is one of the main current problems.

Within the Erasmus MC there are approximately 1500 people who can place orders. Everyday hundreds of orders are placed and things like bundling these orders is something that is not happening right now. This is one of the aspects suppliers aren't happy about. When each day ten little orders are placed they need to ship ten little packages. If this could be handled more efficiently the small orders would be joined together into one big order which would make the supplier happy and give the hospital a big advantage (both in the amount of transactions handled and maybe in the costs). If this problem is not addressed suppliers can start billing shipment costs and that is a situation you want to prevent.

Besides this chain you have the GHX part, this is something that has not been running for extremely long. GHX is very appropriate for standard assortments. Right now the office supplies(link to office depot) and medical disposables are handled by GHX. GHX was originally developed to handle the laboratory's need for supplies. An advantage is that GHX has a 1-on-1 link with our system so we can manage the order history. The people who order using GHX are (among others) secretaries, these people do not have a lot of experience with procurement. They just want an easy system to order something they want/need, preferably with a little picture and a easy to use system.

At this moment there is no purely medical (medicine, implants, etc.) supplier attached to the system. In the future this is one of the considerations for improvement of the system but this is also dependant on how well the Oracle system will function.

Eventually there will be a discussion on the need for GHX, as soon as the oracle system is fully operational it could handle things like the link with office depot but this will have to be decided around that time.

This discussion will be a tough one because GHX offers a carefree solution and the question is if you want to lose that. They handle a lot of the fuss of running a ordering system so our purchasing departments save a lot of time. When this link is cut this means that we as an organization get a lot of extra work and the question is if we want that.

The use of GHX has been expanding, in the beginning the system was not used very much. One of the main concerns was the search functionality, this needs to be as easy as possible in order for users to start using it. This is one of the main concerns, also in the field of e-procurement. The system needs to be very user friendly or else people just won't use it! When placing an order takes a simple user five minutes this could be too long and people start searching for alternative ways to solve their problem/need. Even though there officially aren't any other ways to get what they want people can be very resourceful and in the end they get what they want.

The implementation of Project Spijker will start (first major implementation) January 2010, this will affect my job in the way that soon we will go on a training. Hopefully at the end of this training and when the system is fully operational we will be able to easily get the overview/reports we want/need. One of our main problems is handling suppliers, what do we order from who and when? Streamlining this process, minimizing the number of orders, joining smaller orders together, Comparing suppliers, etc. This whole process will be greatly improved by the new system. When meeting with suppliers it will be much easier to discuss things like things that go wrong, miss-deliveries, dependability of the supplier, etc. All of this information and the discussions that follow can be registered so they can be used (in the future).

This information influence practically everything in the way we do business, it will improve our negotiation position, it will make it much easier to find bottlenecks and streamline the process.

Another thing to map and improve is the Supply Chain Management, the link with logistics and operational purchasing. The whole chain needs to be evaluated and improved. We expect that the Oracle system can help greatly with these improvements.

In the current situation users need to fill out and sign a digital form in order to place a order. In some cases secretaries have 'promoted' themselves and sign these orders themselves to save time. In the new system this will be impossible. This would improve the compliance with the rules but could negatively affect the amount of work that can be done/the amount of orders placed.

The effect of the new system on the whole process will, in my opinion, best improve the aftercare. Things like billing will be handled much faster. Sending and receiving these will be much easier and faster.

The ordering process will partly improve, 'easy' order which can be filled out, signed and sent to BIL within ten minutes will not improve much. Complicated orders spanning different departments are the things that will improve most.

The insight into what happens with your order is another thing that will improve. In the current situation, when you send a order it is gone till you telephone after it or the order comes in, the new system enables you to track your order in the process which will greatly improve insight and control into the process.

Right now it is extremely difficult and time consuming to follow orders and check if they have a hold up ,we hope this can improve so we can check up on them and call suppliers if the ship supplies too late.

Soon all of us (people eligible for ordering supplies) will go on training, this will very probably be a one-day course to teach us all we need to know. After the summer we from the purchasing department will start with these training days, because we will be using the system more intensively we will probably receive a more in-depth training.

Come January the old system will be closed and the new system will be put into use.

Question 4: Do you consider (e-)procurement to be of influence on Patient Value within the Erasmus MC? To what degree?

The main goal for us will always be the patient, giving the patient the best care we can at the lowest costs is our target. In my opinion the patient will not notice these changes directly, the process will be improved for our end and when something goes wrong we will be able to fix it much faster which is something a patient could notice. We will be able to manage relationships with suppliers much better which will improve quality and lower costs and in the long run this is something patients could also notice.

Each new article gets its own dossier, this dossier contains all of the relevant information about the product but also its certificates. Guaranteeing the quality. Because it will be much more difficult to order things outside of the system the quality of the goods used will be more steady which will lower risks and errors.

Because the current system is that budgets are handled decentralized and doctors chose their own supplies, salespeople simply walk into the hospital and get employees to use their products (as a tester) which is something you don't want. The quality of these products is not guaranteed so this has a negative effect on the patient care. One of our concerns is to handle this flow of product into the hospital. This way of working pays off for suppliers because we as a purchasing department do not have a say in what a doctor orders, when they want it they order it.

Because the budgets are handled decentralized the purchasing department holds no responsibility for maintaining budgets, our main concern are the commercial aspects (negotiation, supplier management), of course we try to get products as cheap as possible but we are not responsible when a department stretches their budget.

Appendix E Interview Rens Zwang

Name Interviewee: Rens Zwang
Function: Unit head/manager Special Research & Development,
Member of the 'procurement counsel',
Member of the User Group GHX
Location: Erasmus MC, room L175

Question 1: What is your experience with (e-)procurement?

I am the unit head of the department special research and development. We do all kinds of research and special provisions. From within our department a lot of supplies are ordered, our order people order on a daily basis because of the range of different items we need. My task within this group is to control the budget and mandate large orders. Besides this task I am representative of the AKC (Department of Clinical Chemistry) in the 'procurement counsel' where we discuss the quality of the purchasing and procurement within the Erasmus MC.

I am also a member of the user group GHX which discusses the use of GHX and handles problems and complaints.

Question 2: Can you explain the current (e-)procurement solution/practices within the Erasmus MC? What do you consider positive/negative aspects of this solution?

At the moment there are several order systems in place at the Erasmus MC. The oldest one is Verpli, officially this system is not in use any more but within GHX there is a part (called 'Erasmus MC intern') that handles the old Verpli codes so when older employees want to order something they can still use the old Verpli order numbers.

The current method of ordering is that when an order is below €4.500 (at the Erasmus MC Faculty this amount is €12.000) it can be ordered by an employee.

The second order system in use is GHX, this is used for regular orders. In this system all of the suppliers which have an agreement with the Erasmus MC are listed. This means that all of their products are displayed in this catalogue and can be ordered relatively easily.

When searching for a product it can occur that a certain product has multiple possible vendors. When this is the case the idea was that the employee is triggered to choose the cheapest alternative to incorporate a 'market' in the purchasing process. In practice this does not work at all. Reason for this is the non-functioning search functionality.

When searching a certain product, for example sodium-oxide, vendors use different descriptions and titles for their products. This means that one has the product listed as 'Natrium oxide (Dutch)' the other one has it listed under 'sodium-oxide' and a third has made a name up himself. As a result it is very difficult to compare these products and find the best one.

The biggest complain of users when it comes to GHX is about the search function. This functionality is so bad that even at a national scale a workgroup has been formed to form a list of requirements for the system to be adapted. It is practically impossible for the system to search for 'wildcard's', when searching for sodium-oxide the search term sodium alone will yield so many results the output screen cannot handle them. Which means you have to search for exactly the correct thing in order to get results. In general one could say that GHX is a disaster but this is exaggerated. What can be done by the user, which is a onetime investment, is to create your own order lists. A list of products which you regularly require, creating this list may take a day but when you want to reorder these supplies you can just use your own list instead of trying to go through the whole search process each time.

After searching the next step is authorizing. When this is handled the request/order is send to two locations. The first is the supplier which has to deliver the goods. The second one is the old Verpli system which, although it is not used anymore to handle orders, is linked to the logistical backbone of the hospital and handles the delivery addresses which are not managed by GHX.

After this step the products are delivered in Barendrecht and they handle the delivery at my doorstep. This is all for the 'regular' products ordered using GHX.

The third order system is the electronic order form to be used when a product is not available in GHX.

I remember the first time I used the digital order form I was pleasantly surprised. The old Verpli system was a blue, ugly, unfriendly DOS screen. The new order form was a nice windows screen where you could jump between field with tab and all. But what happened when we filled out the whole form and were ready to push send? There was no send button, instead there was a print button which means that after filling out a digital form it has to be printed, faxed to the BIL (Order and Information Point Logistics) department which has to use this form to fill out the (digital) order form of the supplier. First lesson learnt during this process was that each orders has to be marked 'urgent' in order to prevent your order from being put on the 'regular' pile of orders. This pile could take a few days to be sent out. Another problem in this process is that sometimes information is wrongfully taken over (spelling errors etc.) which could mean your order is lost somewhere in the process.

Question 3: If you could suggest improvements to the (e-)procurement solution of the Erasmus MC, what would they be?

Although it may seem that I am painting a very grim picture here, from my perspective this is still a positive picture. I worked with the old Verpli system and that was much, much more difficult (if not impossible) to work with. During my twenty years of working with it I never learned to use the search functionality which meant that I was depended of the few people who knew the order numbers by memory. Main problem with this old system was that every item was added manually, this addition was done by users who made up their own name and description which meant that the same product could be stored under 6 different names in the catalogue. Another situation that followed from this was that besides extra names these products also all had their own contract/agreements and prices attached to them. This is a situation that was solved when GHX was implemented so it is a great improvement.

But GHX is not a brilliant solution. When you ask a regular user about their experience, I've heard them via the GHX User Group, you do not want to know how they describe the system (negative).

Recently there have been interviews (round table discussions) on the problems of GHX and these experiences have been (when possible) used in the development of the new Oracle system.

Among the things that were mentioned during these discussions about GHX were:

- The lack of a possibility to easily compare products.
- The lack of shipping costs, these were not mentioned in the systems which made comparison by price very difficult.
- No delivery time mentioned

Result of these negative aspects was that a lot of people were ordering their supplies around GHX through regular web shops. Problem with this was that when they did not mention their address very carefully the packages were lost in the huge maze of the hospital.

In the ordering process you have applicants and 'head buyers', the head buyers are usually the people controlling the procurement budget and they mandate the applicants to order on their own till a certain threshold (€4.500). Larger amounts (purchases and investments worth between €4.500 and €100.000) are handled by the head themselves using certain guidelines (multiple tenders, reasoning behind choice, explanation of need for product). Structural investments over €100.000 need a special approach and require more control (/signatures).

One of the ways to handle this situation of a large group of people able to order supplies is to control the budget by removing these mandates and letting everyone come by the head for approval. This system works and it greatly improves control but it results in a head doing nothing but signing orders all day long. The new ERP system will use a part of this in the way that it shifts the current situation (large number of mandated people) to a new situation where when an order is placed it is sent to the head for approval before sending it to the supplier. The question is if this system will hold or if it will shift back to its current situation of a large number of mandated people.

Question 4: Do you consider (e-)procurement to be of influence on Patient Value within the Erasmus MC? To what degree?

Because we are a laboratory we do not have much contact with patients. We provide a service to the hospital staff so in that way our work and purchasing does not affect the patient directly.

A negative experience we as Erasmus MC have had with procurement in bulk and trying to simplify the order process was a attempt to standardize the gloves to be used within the hospital. During a few weeks/months all kinds of different gloves were tested within different departments and after some time a report was issued which stated the best options. One supplier was picked en started delivering all of the gloves for the entire hospital. After the first batch was received problems started to occur, gloves tore without reason. After a inquiry it was discovered that in order to win the fierce bidding war the company responsible for the gloves had moved their production facilities to a low-wage country which was unable to fabricate the gloves decently. This experience influenced the patient care in a negative way. It cost a lot of money and procedures had to be postponed to fix this problem.

A positive experience is the high degree of standardization, lead by procurement/purchasing solutions. Blood transfusion tubes for example, some time ago each department had their own type and brand of blood tube, a nightmare for our lab because in order to analyze the blood we need a standard size tube. After the procurement standardization this was solved and thus the patient's blood can now be analyzed much more quickly.

Another thing the purchasing department has done was create a website with all suppliers and the products under their contracts, this way if I need something I can check this site and see if we already have a vendor who delivers the thing I need and if we have an agreement with him.

My general opinion is that a solid purchasing/procurement solution saves a lot of time and money, both belong directly to the departments/Erasmus MC but indirectly to the patient so they indirectly affect patients in a positive way.

These costs remain a sore subject, with recent budget cuts, demands that keep rising and a budget that keeps shrinking it is now very important to manage time and costs.