



The shaping of inventory systems in health services: A stakeholder analysis

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ABSTRACT

Although many studies have addressed the diagnosing and redesign of inventory systems in an industrial setting, the field of operations management seems to lack a thorough understanding of the process of shaping inventory systems in a health care setting. In this article, a contribution is made to fill this gap by exploring the process of reshaping a hospital inventory system of medicines by means of an exploratory case study. In doing so, we concentrate on the question how the outcomes of this process are affected by the different stakeholders involved. Our case study indicates that decisions made during this reshaping process are heavily influenced by the dynamics of the relationships and interactions between the stakeholders involved in the project. Based on our case study there are also some strong indications especially in a health care setting, the existence of multiple stakeholders having a multi-goal focus regarding the inventory system can have a strong influence on the outcomes of inventory projects. For project managers it is important to be aware of these characteristics and circumstances in order to help health service organisations to develop and use inventory systems more effectively.

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1. Introduction

Since the 90s, the health care sector has changed rapidly. Due to increased competition, a growing influence of patients and a stronger necessity to deliver health services in a more efficient and effective way, many health care organisations have started projects in the area of service quality, clinical pathways, information systems and patient logistics (e.g. Stock et al., 2007; Mahmoud and Rice, 1998). Not only in practice but also from a theoretical point of view the area of health care management has changed significantly. During the past 15 years an impressive number of studies performed in disciplines like Economics, Business Logistics, Operational Research and Business Administration have enlarged our knowledge regarding the health care sector considerably (e.g. Li and Benton, 1996; Jarett, 1998; McFadden, et al., 2004; Ruiz, 2004).

Notwithstanding the fact that hospitals carry large amounts of a great variety of items, health care organisations have paid little attention to the management of inventories (Nicholson et al., 2004). Studies performed in the past as well as more recent research suggest that inventory costs in the health care sector are substantial and are estimated to be between 10% and 18% of net revenues (e.g. Jarett, 1998). At the same time, hospitals are forced to increase their internal service performance and it is also for this

reason why a strong focus on inventory management has become paramount in many hospitals nowadays. It will be of no surprise, therefore, that a large number of hospitals have started with projects in the area of inventory management in order to reduce costs and improve service levels.

Despite having some rather unique characteristics only few studies have addressed the question how the design and implementation of inventory systems in a health service setting takes place. Many different stakeholders are involved in the (re)shaping of inventory systems and together with the diverse and unique characteristics of hospital products, projects in the area of inventory management are far from a simple, straightforward design process in hospitals. Moreover, only a limited number of empirical studies are available regarding the question how conflicting interests and power relationships between stakeholders influence the shaping and implementation of inventory systems in health services. Undoubtedly, having a clear understanding of how inventory systems are affected by the specific characteristics of hospitals can be helpful to strategic and tactical decision-making processes on inventory systems. Additionally, this understanding can also be beneficial for the effectiveness of inventory projects.

In the next section, first the results of a literature study that guided the empirical part of our research are presented. In the second part of our paper, case data is analysed. In doing so we will concentrate on the question how the results of inventory projects in a health care setting are being affected by the different stakeholders involved. The cure and care context of the inventory project as well as some contingency factors that have influenced

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the outcomes of the inventory project are explicitly taken into account when analysing the case data.

We view the contribution of this study from two perspectives. First, the paper aims to advocate the role of stakeholders during the process of shaping inventory systems. Noticeably, this role has not been fully explored in a health care setting and hardly any articles in the area of operations management have addressed this issue explicitly. Additionally, some tentative conclusions are drawn about how the hospital setting of the stakeholders might influence the design and performance of an inventory system. In this way, a contribution is made to identify various issues more profoundly regarding enablers and barriers to the shaping of inventory systems in hospitals.

2. The shaping of inventory systems: lessons from literature

2.1. Introduction

During the last decade numerous contributions have been made regarding the design of inventory systems. Traditionally, many of these contributions focus on the quantitative elements of inventory control. Both timing and quantity decisions are in the central core of the field of inventory management and a huge amount of literature is available on decisions how to determine economic order quantities and order intervals (e.g. Blinder and Maccini, 1991; Silver et al., 1998). Additionally, many researchers have studied the influence of Integrated Management systems like MRP-II and ERP on inventory decisions (e.g. Rabinovich and Evers, 2002; Razi and Michael Tarn, 2003) and it is well recognized nowadays that the design of inventory systems is closely related to management areas like Finance, Procurement, Production and Sales. Additionally, some researches have advocated more recently that it is highly important to take the organisational setting of inventories also into account during the process of designing inventory systems. Zomerdijk et al. for instance consider four organisational areas to be crucial when designing inventory systems (Zomerdijk and de Vries, 2003). The allocation of tasks, the decision-making processes, the behaviour of the parties involved in the inventory system as well as communication processes appear to be important contextual factors when analysing and redesigning inventory systems. Based on a longitudinal case study, De Vries (2005) elaborates further on the notion that a complex relationship exists between inventory control and its organisational design. The findings of this longitudinal case study suggest that organisations often try to neutralise shortcomings in the inventory planning and control system by applying organisational measures. However, negative forms of congruence also seem to exist implying that shortcomings in the inventory control system can be negatively re-enforced by its organisational setting as well (De Vries, 2005).

Not only the operating performance of inventory systems influenced by organisational factors. The process of re-shaping and designing inventory systems apparently is affected by organisational processes either. In general, it is well known that various groups of people in organisations may have different perceptions of management systems (e.g. Webster, 1995; Coakes and Elliman, 1999) and studies performed in the area of information systems show that the design of information systems can often be explained by the actions and attitudes of the stakeholders involved in the process of shaping these systems (e.g. Knights and Murray, 1992; Boonstra, 2006).

2.2. Inventory systems and health services

Notwithstanding the impressive body of knowledge regarding inventory management in an industrial setting, some gaps and

holes exist in our knowledge when trying to translate this knowledge to a health service setting. Clearly, a number of problems show up when transferring the techniques and approaches developed in industry directly to the management of inventories in hospitals. In a hospital, in many cases patient caregivers must be sure that particular products like drugs are always available. Additionally, in many hospitals it is not always clear what party is responsible for the money tied up in inventories. Moreover, decision-making processes in the area of inventory management within hospitals apparently are often heavily influenced by the many stakeholders involved. Some studies suggest that setting par levels for items in a health care setting tend to reflect the desired inventory levels of the patient caregivers and often seem to be more politically and experience-based driven rather than data-driven (Nicholson et al., 2004). Finally, inventory management projects in hospitals are often strongly linked to automation and to projects in the area of information, patient logistics and supply chain management. Manual dispensing of medications in hospitals in Canada, the United States and Europe for instance, is more and more replaced by automated medication distribution systems in order to help with distribution of medications to patient care areas and to improve inventory control (e.g. Novek, 2000).

One of the interesting differences between inventory systems in an industrial setting compared to inventory systems in a health care setting is the organisational context of the system. Obviously, many different stakeholders can be distinguished when studying inventory systems in health services among which nurses, pharmacists, doctors, care managers, financial managers and information specialists. Starting from the notion that different stakeholders may have different perceptions and interests with respect to the inventory system, the question arises how inventory projects are influenced by these stakeholders in a health care setting. There are indications for instance that the health service sector faces some specific inventory-related problems because a relative high percentage of their budgets is tied up in inventory and the required labour to manage it (Oliveira and Pinto, 2005). It can be hypothesized that one of the main reasons for this inefficiency is rooted in the existence of hidden stocks in order to avoid stock-outs. The shaping and operation of inventory systems in health services in other words, probably is heavily influenced by organisational processes as well. However, little to no understanding exists regarding the social and technical mechanisms underlying the process of (re)shaping inventory systems in a health care setting and it is for this reason why an exploratory case study was performed to deepen our understanding of this process.

In hospitals, often inventory systems for medicines are mix of centralized and decentralized stores in which medicines are kept in stock. Additionally, trade-off decisions between costs and the level of required service are probably more complex and difficult in hospitals in comparison to manufacturing companies. Understocking of medicines can result in increased dissatisfaction of physicians and/or surgeons and a lacking operational performance of the hospital, for instance delays in surgery. In a worst case scenario, a shortage of medicines ultimately can even cause the death of patients. Overstocking at the other hand, generally results in an increase of carrying costs. Costs due to obsolescence, depreciation and spoilage together with an increase of interest costs can be excessive in the case of high-priced pharmaceuticals. Finding a proper balance between quality metrics (timely treatment, adequate amount of services and meeting professional standards) and costs without doubt, is one of the main logistical challenges, hospitals are confronted with.

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