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JUST-IN-TIME MANAGEMENT IN HEALTHCARE OPERATIONS

A Capstone Experience/Thesis Project

Presented in Partial Fulfillment of the Requirements for

the Degree Bachelor of Science with

Honors College Graduate Distinction at Western Kentucky University

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2015

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ABSTRACT

Reducing costs and improving quality are two of the most important goals in managing healthcare operations. In this study, we explore how to improve healthcare operations by integrating Just-in-Time (JIT) management system. We first introduce the JIT management system, and then discuss how it can generate benefits in healthcare operations. We investigate implications for healthcare practice, which include how JIT techniques can be applied to healthcare operations, how hospitals and general practices can use JIT techniques, how JIT can help the patient throughput rate, and how technological advances can speed up healthcare processes. Implications for management and directions for future research are discussed.

Keywords: Just-in-time management, Healthcare operations, Lean manufacturing

Dedicated to
My mentors, family and friends

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FIELDS OF STUDY

Major Field: Finance Management

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CHAPTER 1

INTRODUCTION

Just-in-Time (JIT) is a method of industrial organization aimed at producing only what is needed, when it is needed. The competitive benefits of JIT management are well implemented in both manufacturing and service industries. In JIT management systems, a process is capable of instant response to demand without the need for excess of inventories. The goal of JIT management is the total elimination of inventories at all stages of the process. Therefore, the major objective of JIT management philosophy is that the organization should aim zero inventory levels throughout the entire supply chain. The JIT management system originates from Toyota of Japan. Toyota was the first company to implement this system successfully (Monden, 1993); hence, the JIT management system has given this manufacturing company big advantage in terms of low inventories in their supply chain, which resulted lower operational costs.

In the JIT management system, the main idea is that inventory shouldn't be overstocked; it should be delivered at the right time and to the right place. There are six key elements: Kanban system, the management commitment and employee involvement, elimination of waste, small lots and quick setups, total quality management, supplier relationships (Pheng & Chuan, 2001). Kanban is a Japanese word, which signals the delivery of components from one workstation to another in Japanese cards, and is referred to a pull system in a manufacturing floor. This principle is an essential part of the

JIT philosophy to promote deliveries when the company needs due to the customer demand. Thus, the company is able to minimize costs and improve efficiency in delivery of its supplies. In addition to Kanban, the JIT is also about continuing to improve the efficiency, which is called Kaizen. In light of sustaining continuous improvement, management's efforts and leadership are very crucial to provide a nurturing and inspiring workplace, which will lead to higher productivity. Continuous improvement can't be achieved unless top management is willing to commit fully and employees are encouraged to engage in quality processes.

The JIT management systems is considered more than a tool to reduce inventories in companies, it is an all-encompassing philosophy geared to eliminating waste and anything that does not add value. Anything in each step of the supply chain that is overstocked and adds no value to the final product is regarded as a waste, because inventory takes up space, and ties down capital, which also incurs storage cost and insurance cost. Moreover, the inventory has the risk of damage during storage and the risk of obsolescence as well. Therefore, promotion to eliminate waste is extremely important for successful implementation of JIT management. In a supply chain, small lots mean less average inventory, shortened manufacturing lead-time. Also, quick setups drive smaller lot sizes, make additional capacity available (often at bottleneck resources), reduce scarp and rework, and increase flexibility.

Quality is the fundamental goal of any management philosophy, so does JIT. The Total Quality Management (TQM) is a very proactive and systematic approach to improve and sustain quality while cutting costs across the supply chain (Anh & Matsui, 2007). The TQM promotes prevention and immediate detection of errors and problems at root

source. The other principle for TQM is continuous improvement of quality across the company. Due to the need to continuously improve and sustain high levels of quality in a company, all of the employees should be encouraged and motivated to innovate to reach better levels of quality. In addition to the concept of quality, the supplier selection plays a vital role in any manufacturing or service company. One of the main differences between traditional purchasing and JIT is that JIT focuses on single sourcing. Single sourcing can increase customer intimacy, because a single supplier understands customer's demand better, and suppliers are better equipped to plan their own schedules in accordance with their customer's needs. It can also enhance the relationship between suppliers and customers. This kind longtime relationship is a win-win situation for all the players in the supply chain. To suppliers, it assures a stable business environment no matter how the market changes. To the buyer, it assures a better price and volume certainty. Hence, the JIT management system emphasizes on single sourcing instead of multiple suppliers.

CHAPTER 2

DISCUSSION OF THE JIT IN HEALTHCARE OPERATIONS

The most common definition of JIT is always attached to manufacturing operations; however, it can apply to non-manufacturing industries as well, such as service sector firms. Both service and manufacturing firms create an end product and service; hence, the JIT techniques can be applied to both environments. Although healthcare is considered as a service industry, there are still some significant differences between healthcare and service industries. First of all, healthcare providers are not able to stock their services and provide limited service or product like other traditional service companies do. Secondly, healthcare providers maintain a similar distribution chain like manufacturing but a more complex inventory system. Thirdly, it is very hard for healthcare decision-makers to forecast their demand, because the demand is based on daily patient census without any stable pattern. Therefore, high levels of buffer are common in healthcare operations. All of these differences make the healthcare a unique but complex industry.

The supply chain management of healthcare operations can be positively affected if the JIT management is implemented in each step. It is crucial that the supply chain of any organization needs to be connected with a series of smaller organizations, resources, and activities involved in the creation and delivery of value, in the form of both finished products and services, to end customers. The JIT enables great improvement in supply

chain by providing right materials, low costs, and efficient services to facilitate patient care. In the healthcare operations, guaranteeing the great service and right products at the right time is very crucial. Continuous efforts to improve efficiency and eliminate the waste throughout the supply chain are important as well. Additionally, in the JIT philosophy, the main goal is to achieve zero levels of inventory. However, the demand for healthcare is based on daily patient census; it cannot be forecasted like other manufacturing and service companies. In the healthcare supply chain, the purchasing department should be built upon a long-term relationship with a small set of suppliers that will not only improve the supply efficiency but also lower the inventory cost. Medical Sterilization Inc. (MSI) is a successful example of adopting the JIT management system in healthcare industry. MSI offers contractor-provided reprocessing and sterilization of surgical equipment, which employs a highly hospital-tailored version of JIT. Furthermore, hospitals' daily supplies, such as folders, are being overstocked, which take up space and ties down the cash flow.

Regarding the instances, in which the JIT management system can be applied in healthcare operations, cutting the costs by effective inventory management has very significant impact. Material costs, labor costs, and manufacturing costs are the main parts of patient care costs. In the healthcare management, all levels of management should be connected to all of the important decisions and put their efforts to the area they are specialized in. In this way, healthcare organizations can achieve lower levels of operating costs from parts, distribution and utilization of their resources. Moreover, healthcare organizations can first specify what kind of customers they are serving, what age group their patients belong to, what kind of service or products they need. Then, based on all

these information, decision-makers can create a database, which will benefit their operations and customers. This kind of commitment to quality patient care is a reflection of the JIT philosophy. Additionally, maximizing resource utilization in the supply replenishment process is beneficial for the healthcare organizations. Hence, purchasing, materials management, and distribution departments should all be connected in the operations. For example, purchasing can help materials management because they know the inflow of goods better, and procurement managers in health organizations can order products directly whenever the products are needed. In this way, the decision-makers can maximize the utilization of their critical resources.

CHAPTER 3

IMPLICATIONS FOR MANAGEMENT IN HEALTHCARE OPERATIONS

Most healthcare organizations have boards and doctors that work together for the good of the hospital. All of these decision makers should be informed about what the JIT management philosophy is, how it helps to increase efficiency and decrease inventories, how bottlenecks can be found, how to implement solutions, etc. The first step to institute the JIT philosophy in a healthcare organization is to perform a system analysis and figure out where bottlenecks and inefficiencies exist. Wennecke (2008) worked with a group of healthcare providers in a closed setting to provide novel JIT solutions for improving healthcare systems. The group came up with many different solutions. However, all of them had to be measurable, “either as time saved, fewer loops, fewer steps, lower costs, and so on.” Wennecke (2008) also stated “a solution must be sustainable.” The changes made using JIT techniques must be long term fixes instead of quick slashes that may cause a quick fix to a bigger problem. Wennecke (2008) shows that doctors are capable of introducing the JIT techniques in their hospitals if given any chance. Therefore, the top management in healthcare organizations should promote and support any efforts that lead to leaner operations in each step of the supply chain.

General practices are often at the forefront of a healthcare operation. Patients begin their journey through the system when they first walk into a general practice clinic to be examined by their general practitioner. They are often evaluated based on their

symptoms and either discharged, taken for further examinations, or sent to a larger healthcare facility. A general practice often has no trend in the amount of patients seen day to day. Therefore, the healthcare organization always has to have enough inventory on hand to treat patients without any critical shortages. However, in the JIT management systems, the main goal is to minimize holding inventories at each step of the supply chain.

Mann (2010) is an executive member of a group designed to help general practices by taking advantage of lean manufacturing practices. Mann (2010) states “Anything that helps us to deliver our work in a way that is best adapted to the needs of our clients in a simpler, slimmer and speedier way must be worth knowing.” Even if the general practices have taken a long time to switch over to applications of the JIT management system, they intensely search for new ideas to increase the level of lean processes in their entire supply chain in order to save money by reducing the inventory, while still improving and maintaining quality care for their patients. Furthermore, Mann (2010) explains that there are 3 ways to introduce lean manufacturing into healthcare organizations. Firstly, he expresses “Take a keen interest (as a primary care team) in what patients and their careers tell you about their experience of receiving care.” This describes the fact that the primary care providers should actually listen when patients review their care. Once it is possible to determine what is wrong with the system, it becomes possible to suggest a solution. Secondly, he writes “In meetings where decisions are being taken, insist that brainstorming is not accepted as providing a workable solution.” This describes that instead of just brainstorming and ending the meeting make sure that patients and doctors are asked how the solutions would be received to make sure

that they are feasible. Lastly, he states “Ask patients and staff the leading and inviting question, ‘how do we waste your time’?” This describes that it is important to ask the patients about wasteful moments in their experience because it may not be possible for the doctors to know what has been happening before they see the patient first hand. Therefore, inventories in the healthcare organizations can be reduced dramatically, if general practices can identify questions such as described here and come up with novel solutions.

Hospitals have much larger bottlenecks and inefficiencies in their daily operations than small general practice clinics do due to their size, seeing thousands of patients and employing hundreds of employees. The level of inventory in a hospital can be extreme, so the JIT management system is a perfect tool to reduce costs while maintaining quality patient care. However, how can you decrease the level inventories in an environment that has so much capital intensity and resources? Brandt (2011) discussed how JIT was applied to a surgical room in a hospital. A surgery requires many different medical personnel, pieces of equipment and medical tools. It can be very complex to try and reduce inventory. After applying a JIT analysis, it was realized that the surgical room had medical tools in many different locations. This led to nurses running all over the place in the middle of a surgery looking for a certain instrument. Applying a strict organizational structure allowed for inventory to go down, because it was much easier to see inventory levels and replenish them before stock outs. This also helped the hospital to minimize waste due to spoilage of perishable goods.

It is also important for hospitals to have very updated charts on every patient. Each patients chart is very important, because it can tell the hospital information about

inventories. For example, if you know that a patient is diabetic you need to be sure to have enough insulin and needles on hand, which is inventory, while not having too much that it costs a lot in holding costs. Second, it can tell the hospital vital information about a patient that can help with throughput rate. If the patient is always receiving quality care then they are more likely to get through the system quickly because they will be discharged. Having an advance in technology has allowed for electronic charts to take over many hospitals.

Nace (2006) discusses how electronic charts have helped a hospital first hand. Doctors and nurses can quickly check facts and enter information about a patient that can be electronically seen from any area in the hospital. This eliminates the large amount of paper that was being used for every new patient seen and also eliminated a large amount of 'running around' time that often occurs in hospitals. It is much easier to transfer the patient around the hospital to different departments and doctors and have an electronic chart always be there. There is no more having to call up the previous doctor about messy notes on a paper chart.

Patients are at the core of healthcare systems. Without patients filling hospitals, clinics, care centers, etc. there would be no need for a healthcare system. Considering a general perspective, the most important aspect of the JIT techniques is patient throughput rate. Ultimately, it is how many patients can a healthcare system get through their doors and out everyday. Thus, it is important to have a high bed turnover while still maintaining a high level of service. The JIT techniques can help decision-makers to find the bottlenecks and inefficiencies in a healthcare organization and offer solutions. Jenkins and Gisler (2012) discuss these issues and how they affected the Central Baptist hospital system by

using a value stream mapping technique, which visually showed the route of patients in the system during their flow time in the system. This analysis helped the decision-makers to realize an average time frame showing the locations of bottlenecks in the system. Due to the patient gridlocks, it was clear that significant gaps in communication and coordination among employees and different departments existed. Using a lean tool, the value stream map, provided a solution of all the main decision-makers to meet every morning and discuss data that needed to be shared. These data sets consisted of current occupancy, nurse staffing, pending admissions, etc. Therefore, the hospital has started achieving quicker admission with less waiting times on average because of the JIT management system. Additional, there are more ways to increase the patient throughput through better medical practices in the healthcare organizations, often by the advancement of technology.

CHAPTER 4

CURRENT TECHNOLOGICAL JIT INNOVATIONS IN HEALTHCARE INDUSTRY

Holter Monitoring Systems: The Holter Monitoring System is a small device that features software that is designed to be easy to use and informative without being invasive. It uses a recorder to detect abnormalities in a patient's heart rhythm over a long period of time. They are comfortable for the patient to wear, and lightweight and compact.

Stylet for Endotracheal Intubation: The new Glide Scope is a reusable stylet that allows for easy intubations in surgeries and the ER. Since it is made from stainless steel, it can be cleaned and sterilized just as other surgical instruments. This decreases the inventory of stylets that are needed in a hospital. It also is rigid and shaped to the trachea, allowing for doctors to not waste time manually shaping a stylet.

Asset Tracking System: The Homer asset tracking system is a new technological system with a single, mobile antenna that uses radio frequency identification to locate and recover hospital equipment. This device does not need a large space for major infrastructure, and can be seamlessly integrated with minimal installation.

Pneumatic Patient Positioners: These positioners help hospitals and surgery centers to save time and resources. It is designed to be placed under the patient and inflated in order

to help support some of the weight of the patient so that they can be slid from the hospital bed onto the surgical table.

OR Integration System: An integrated system that manages electronic imagery and patient data during surgery. It offers a live transmission of images and video recording. This allows security for both the patient and the doctor. This system can also help to see bottlenecks and inefficiencies in the system.

Portable Vital Signs Monitor: Portable monitors check patients' vitals signs and help to decrease the amount of inventory required. Due to this monitor, healthcare organizations no longer needs to have large, very expensive machines, which are moved from room to room. The new technology has brought portability and efficiency to the healthcare facilities.

Inventory Management System Uses radio frequency identification and networking technologies to track medical inventory. This allows for a much smaller inventory because it allows for no stealing or loss of product. Each and every unit that is purchased can be accounted for. This allows for better managing expiration dates on time sensitive products. Everything is online for the key decision makers to account for.

CHAPTER 5

NEW RESEARCH DIRECTIONS FOR JIT IN HEALTHCARE OPERATIONS

Healthcare operations can always be improved and will continue to be improved as technology advances. It is easy to see that just in the past 10 years, which is when the previously discussed innovations were created, that technology in healthcare operations has come a long way. As technology advances so can improvements in efficiency. The JIT management is not only about eliminating inventory to zero but also about improving efficiency and quality. We have seen a great number of successful examples in which JIT management has been applied in manufacturing sector. At the same time, JIT management is becoming more and more integrated into hospitals and general practices as well. We observed in this research that effective inventory management and supply chain management are key variables of healthcare operations that affect the efficiency and performance of the hospitals in the healthcare sector. However, there are numerous ways to improve healthcare operations by incorporating with JIT principles, such as total visibility of all components of the process, continuous improvement of the process, employees' actively involvement and holistic approach to eliminate waste (Duclos, Sih, & Lummus, 1995, p. 39). All these approaches can be applied to healthcare operations. As a result, we can also see that manufacturing and healthcare service share lots of similarities, especially in the supply distribution and inventory control, nevertheless, the differences should be noticed as well in our future new research.

CHAPTER 6

CONCLUSION

While countless academic research focused on JIT in manufacturing firms are being revealed, we hardly see JIT management research in service sector, especially in healthcare operations. Through our study and research in JIT management in healthcare operations, we analyze the similarities and differences between manufacturing sector and service sector, then we conclude that JIT management is an appropriate access to improve healthcare operations, in particular, in effective inventory management and supply chain management area. As a result, we can ultimately increase the patient throughput rate. In addition, abundant evidences about current technologies and leading firms in which implemented JIT management are provided in our research paper. With the rapid development of technologies, we believe that more and more hospitals or general practices will apply JIT management to their healthcare operations.

REFERENCES

- Anh, P. C., & Matsui, Y. (2007). Effect of Total Quality Management and Just-In-Time practices on Competitive Performance - Empirical Evidence.
- Brandt, D. (2011). Lean's anatomy. *Industrial engineer*, 43(9), 50-59.
- Duclos, L. K., Sih, S. M., & Lummus, R. R. (1995). JIT in services: a review of current practices and future directions for research. *International Journal of Service Industry Management*. doi:10.1108/09564239510101518.
- Heinbuch, S. E. (1995) "A case of successful technology transfer to health care: Total quality materials management and just-in-time", *Journal of Management in Medicine*, 9(2), 48 – 56.
- Jarrett, P. G. (2006). An analysis of international health care logistics: The benefits and implications of implementing just-in-time systems in the health care industry. *Leadership in Health Services*, 12, 295-304.
- Jenkins, J. (2012). Let my patients flow. *Industrial Engineer: IE*, 44(5), 39-47.
- Just in Time. http://www.slideshare.net/RoshaanRosh/jitpresentation?next_slideshow=1, August 23rd, 2014.
- Low Sui, P., & Choong Joo, C. (2001). Just-in-Time Management of Precast Concrete Components. *Journal of Construction Engineering & Management*, 127(6), 494-521.
- Mann, R. (2010). How do we waste your time? Getting a handle on 'lean' healthcare in general practice. *Education For Primary Care*, 21(2), 120.

- Michelsen, C. J., O'Connor, P., & Wiseman, T. (2014). Just in Time. *Defense AT&L*, 43(2), 32
- Monden, Y. (1993). Toyota Production System: An Integrated Approach to Just-In-Time.
- Nicholas, J. (2012). An Integrated Lean-Methods Approach to Hospital Facilities Redesign. *Hospital Topics*, 90(2), 47-55
- Waldrop, P. S., & Scott, T. E. (2000). Making Total Quality Management + Just-in-Time Manufacturing Work.
- Wennecke, G. (2008). Kaizen - LEAN in a week: How to implement improvement in healthcare setting within a week. *MLO: Medical Laboratory Observer*, 40(8), 28-31.
- Whitson, D. (1997). Applying just-in-time systems in health care. *IIE Solutions*, 29(8), 32-42

