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A Case Study of Just-In-Time System in Service Industry

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Abstract

Waiting in lines are experienced in our daily schedule. Waiting lines or queues cause inconvenience to customers. Just-In-Time (JIT), the dignified process of waste reduction and has been a very popular operational strategy because of its success in the manufacturing and production industry over many years. Various benefits like, improved operational efficiency, waste reduction, and faster response have been widely observed by previous researchers. Services are much like manufacturing. Therefore, successful implementation of JIT is vital to manufacturing as well as service industries. JIT focuses on the process, not on product. Therefore it can be applied to every process within manufacturing or service industry. The main objective of this research is to make use of a case study to present various issues regarding implementation of JIT for a service industry. This case study also shows the benefits of reduction in waiting period by employing JIT. The conclusion of this research indicates that JIT system is successful and operating JIT system leads to many advantages to the case industry.

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Keywords: Just-in-time, service industry, inventory systems, case study

1. Introduction

Traditionally, manufacturing industries compete on price, variety and after sell service. Now, these conditions are merely fundamentals. Few service industries exist today without offering these requirements but the key competitive factor has become speed. Many industries have been trying to adopt few new business tactics in order to stay alive in the new competitive market, and there is no question that the elimination of waste is an upcoming and essential constituent for survival in today's world. The traditional inventory systems based on long production runs, stock based inventories and uninterrupted production needed to be replaced by more flexible systems in order to meet new competitive and economic challenges. Lean manufacturing or also known as lean production has been one of the most popular paradigms in waste elimination in the manufacturing and service industry. [6]

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A just-in-time (JIT) inventory system was introduced as a substitute for the traditional inventory systems. Just-in-time production system is one of these initiatives that focus on reduction in wastage by eliminating non-value added activities. [4] The tools and techniques of JIT have been widely used in both production and service industries starting with the introduction of the original Toyota production system. Taylor introduce the simple concept of lower inventories with deliveries supplied just-in-time (JIT) for manufacturing process has vital effects internal to the organisation and externally throughout the supply chain. [5] Commonly used classic lot-sizing models (EMQ models, etc) do not reflect current just-in-time (JIT) lot-sizing models. [8] A multiple-objective genetic algorithm based system is developed to determine the optimal number of kanban and its size and is applied in a JIT-oriented manufacturing company to express its feasibility. In the integrated system, a simulation based model is designed to simulate the multi-stage JIT production system of the firm. [2]
The basic aim behind the JIT is waste elimination. Waste is defined as everything that does not add value to the end product from the user's perspective. The basic objective of JIT system is to assist manufacturers who have an aspiration to improve the company's operations to become more competitive through the implementation of JIT system tools. JIT is to provide only what is needed by customer, when it is needed and in the quantities ordered. The manufacturing of goods is done in a way that minimizes the time taken to deliver the finished goods, the man-power required, the work-space required, and it is done with the highest quality, and usually at the lowest cost. To remain alive in the fast growing global market, JIT discipline has to work in each aspect for waste reduction in order to optimise the cost. The most important source of waste is inventory, work in process material and finished parts do not add value to a product and they should be either eliminated or reduced. It is found that reduction in the inventory causes reduction in the sources of waste. The activities developed during the implementation process of JIT are investigated and grouped as latent independent variables of these companies. [7] JIT production systems has five major benefits as reduction in inventory, improved quality, productivity improvement, increased profit margin, and increased competition position. [1] Just-in-time is a control technique and also a way to improve the production environment. The benefits from the JIT are only possible under JIT environment only. The JIT system guides the foundation for implementing the JIT control techniques and improvement of the JIT environment. In a JIT system it is very essential to shift to a higher degree of process control in order to strive to reduce waste.

2. Background Of The Case And Research Method

Waiting and queuing problems are most common features not only in daily-life situations such as at a restaurant[12], public transportation [13], bank [9] or postal office, seaport [10], healthcare [11], call center [14] but also in more technical environments such as in production [15], computer networking and telecommunications [16]. It shows that waiting time can be reduced by keen services for both short and long-term projects to improve customer satisfaction. [17] Generally, however, the application of such techniques for daily-life problems has remained rather restricted. This paper is about an innovative approach to reduce waiting time of pilgrim at Pandharpur, an important pilgrimage center in India. This center is located at the bank of holy river Bhima and is popularly known as Dakshin Kashi. It is considered to be the abode of Lord Vishnu in the form of Vitthal. This center attracts a large number of visitors (16 million a year) from all over the country irrespective of their caste, religion, belief, social status and professional affiliation. The main objectives of any pilgrim are to have bath in the holy river i.e. Bhima and then darshan by touching the feet of principal deity i.e. Lord Vitthal.
Over a period of 400 years the number of visitors to the temple town has increased by many folds. Pandharpur is the pilgrimage center where pilgrims visit all over year but mostly it is a periodical pilgrimage center. The pilgrims are coming in number of batches from 2 lacks up to 5 lacks. Such a huge traffic generates tremendous stress on the physical and social infrastructure of the temple town. Being tradition bound institute; certain modifications on layout, procedure, etc are not acceptable. The pilgrims, exposed to modern society norms, who came to the temple, expect a better service quality, and shorter waiting time. Thus, the challenge is to balance the tradition, operational easiness and increasing pilgrims' expectations.
As pilgrims are coming in batches, they have to wait hours together for darshan of Lord Vitthal. As they came for darshan of Lord Vitthal, there is very less chances of balking, means no pilgrim will leave the queue as the queue is long than expected and there is no chance to change the queue because only single queue is present as there is only one deity (one server) i.e. Lord Vitthal. There is no chance of more queues as we observe in multi server queuing theory. It is observed that pilgrims have to walk about seven kilometers in the same queue. And within the long

queue there are so many environmental problems such as uncomfortable facilities like drinking water, natural duties, etc. The old pilgrims as well as pilgrims with children found it very difficult to walk within the long queue. There are number of over bridges in the queue so it is very difficult for the old or aged pilgrims to step up and down. Again they have to walk in sunshine or few times in the rain also. In periodical pilgrimage, the Vitthal Rukmini Mandir Samity set up the infrastructure for the queue on the predefined roads for seven kilometers. In such periods, pilgrims have to wait for more than 24 hours for the darshan, which is approximately one second. Whether it is necessary to wait for so long for darshan is the answerless question at this time. For many pilgrims, waiting in lines or queuing is frustrating or negative experience. Long waiting will affect service evaluation negatively.

3. Need of Research

To most pilgrims, the waiting experience is that most matters. The real reason why pilgrims are not prepared to wait too long is that the average workload per week has increased. In addition, the tremendous growth in the service sector has turned weekends into working days and working days into 24-hour operations. It concludes that as pilgrims are cautious about their time, waits seem more wasteful than ever.

Long waiting time in any servicing station is considered as an indicator of poor quality and needs improvement. Every customer also did not like to wait for long time. If the waiting time or service time is found more customers may leave the queue prematurely and this in turn results in customer dissatisfaction. The waiting has significant impact on pilgrims' satisfaction. The time pilgrims spending on waiting influence their satisfaction. Research has demonstrated that satisfaction of customers is affected not just by waiting time but also by their expectations or attribution of the causes for the waiting. As a result, one of the issues in management of queue is not only the actual amount of time the pilgrim has to wait, but also their perceptions of that wait also. The prime goal is to maximize the level of pilgrim satisfaction with the service provided.

4. Problem Definition

Darshan is the prime purpose for which a pilgrim visits the Pandharpur in the pilgrimage period. The output per day is fixed and is a combination of the processing rate and the darshan duration available. The current processing rate of 40 pilgrims per minute translates to 2,400 pilgrims an hour. At pilgrimage period, darshan may be kept open for 14.5 hours. This would provide a processing capacity of 34,800 per day. It may be noticed that the output rate is constant and arrival process is stochastic. When the number of arrivals per hour is more than 2400, wait would occur. The actual waiting time would be proportional to the number of pilgrims in the queue. The waiting duration in hours would be the number of pilgrims in the queue divided by a hourly output of 2400. The number waiting in the system would decrease proportionately when the arrival rate is less than 2400 per hour.

The greatest disadvantage of the current system is that a particular pilgrim did not know how long it will take him to reach in front of deity, how many individuals are ahead and should there be an interruption in service (why and how long). Because of the great privilege and tolerance required in undertaking such pilgrimages, the pilgrims at large are willing to undergo the excessive and unexplained delay.

Pilgrim's average waiting time of darshan can vary from 1 hour to 5 hours in regular days. And it may be increased up to 24 hours in the pilgrimage period. There is anxiety as how many pilgrims are ahead. There is also tremendous uncertainty as when one would reach in front of deity. Finally by First In First Out (FIFO), pilgrims arrive in front of the deity. The actual darshan time is about 1.5 to 2 seconds. The darshan time of pilgrim in front of deity cannot be increased. The number of queues also cannot be increased as only one deity is present. It is only possible to apply selected management / industrial engineering tools to reduce the waiting period of pilgrim as well as to make waiting time enjoyable.

5. Methodology

The JIT approach enables to achieve high product quality with optimum resources in manufacturing industry. JIT approach is based on lean manufacturing system which develops to improve and optimize manufacturing efficiency by reducing lead time through waste elimination and kanban. Kanban system achieves minimum level of inventory. It ensures the supply of right part, at the right time, in the right place and in right quantity. Kanban system is system to manage and control flow of material in manufacturing industry. Cards are used to regulate material flow throughout process. JIT concepts are originally developed in the manufacturing domain. It can be identified, analyzed and altered to fit and benefit service organizations. If the service organizations apply JIT techniques to reduce non-value added activities, they will have more time to focus on value added activities, which will improve service to their customers and provide better operating environment for the organization.

6. Result and Discussion

This case study is done within a pilgrimage period at Pandharpur. A software based program is uploaded on the official site of Shree Vitthal Rukmini Mandir Samity, Pandharpur. The slots were provided day wise and at a frequency of two hours. At this level, the queuing system can be modeled by a G / D /1 queue, with stochastic arrival and deterministic service time and only one server. The darshan rate is 2400 pilgrims per hour. As this system is introduced first time and the pilgrims are mostly from rural area, only 500 availabilities were opened within two hours. The number of JIT booking per hour will be increased in future.

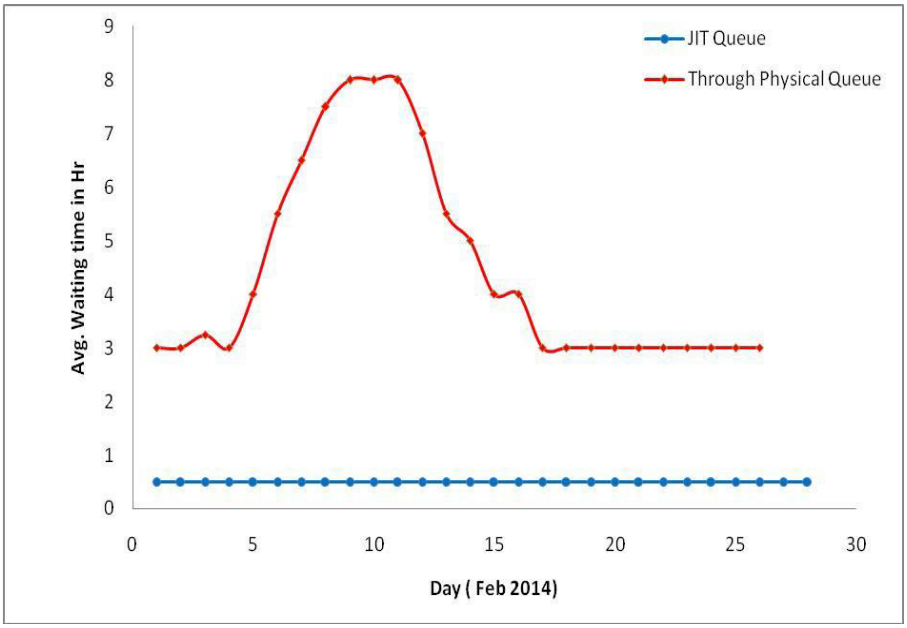

Figure 1: Waiting time in hours per day in the month of April 2014

Also the data of pilgrim's waiting time for all the days is collected and tabulated below. From this it is observed that minimum average waiting time is 3 hours in the normal days. It goes on increasing up to 8 hours in the pilgrimage days. From this it is clear that there is very rush for darshan in the pilgrimage period and JIT system was partially utilized by pilgrims. The waiting period for the pilgrims was reduced by almost seven hours by using JIT system. Figure 1 shows the average waiting time in hours per pilgrim for darshan day wise. The pilgrims had chosen their date and time according to their availability. Pilgrims registered through web site. After successful registration,

individual got a ticket indicating Name, Place of living, Date and time of Darshan. Thus the pilgrim booked his or her time of darshan. These pilgrims have to produce the tickets at 'Tukaram Bhavan' half hour before the darshan time. After verification of photograph on the ticket and date &time, these pilgrims are allowed to enter the queue of darshan. Hereafter within 15 minutes he or she gets darshan, thus reducing waiting time. Thus waiting time for the pilgrims, who have utilized JIT facility, is maximum 30 minutes.

The following table indicates the date at which JIT darshan facility was made available and accordingly the number of pilgrims booked their names. It also shows the total number of pilgrims took darshan on that day. This data was gathered in the pilgrimage period in the month of February 2014.

Table 1: Date wise number of pilgrims through "JIT" & Physical Queue

Sr. No.	Date	Number of Pilgrims Booked through 'JIT'	Number of Pilgrims by physical queue
1	February 07. 2014	1348	27454
2	February 08. 2014	4000	30462
3	February 09. 2014	4000	30975
4	February 10. 2014	4000	31115
5	February 11. 2014	3925	28469
6	February 12, 2014	625	25737
7	February 13. 2014	113	25394
8	February 14. 2014	124	22097

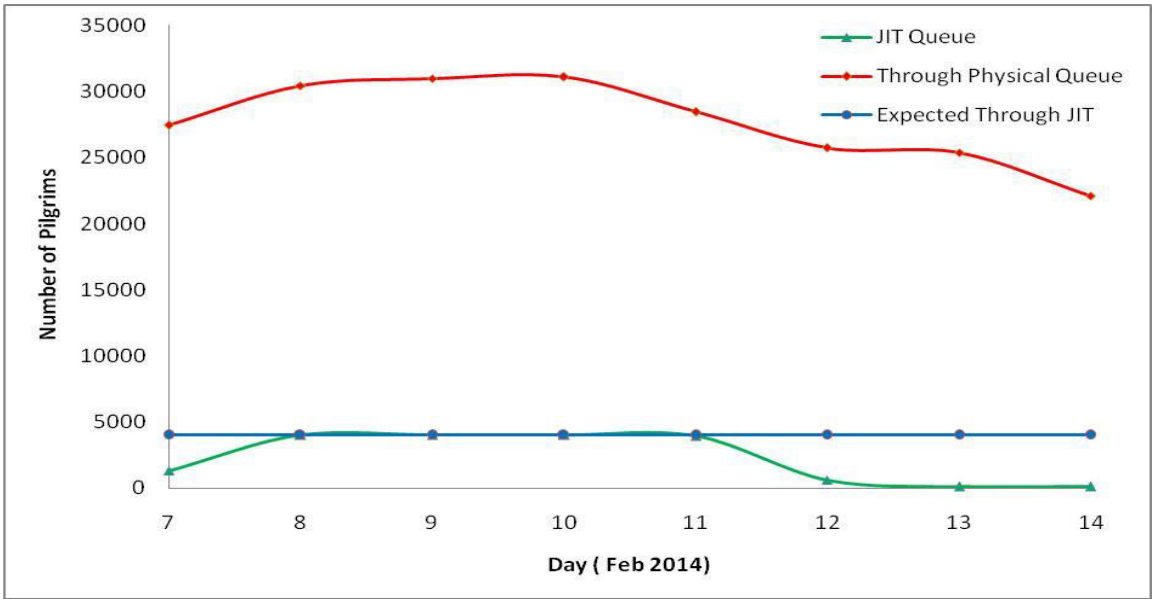

Figure 2: Number of pilgrims through 'JIT' and Physical Queue

7. Conclusions

The case study is done in the pilgrimage period. In this period, the average waiting period of the pilgrims, who have taken darshan in physical queue was recorded as 8 hours whereas it is about 30 minutes for those who use Just In Time facility. It clearly indicates that waiting period is reduced by 'Just In Time'. Moreover the pilgrims had already booked their return journey tickets prior to darshan as they were aware about the exact time of darshan. This is not possible for the pilgrims who took darshan being in queue as uncertainty about the waiting period. It is also found that donation collection within this period was increased as compared to last pilgrimage period. Looking to all these advantages, management has decided to increase the quota for Just In Time in the next pilgrimage period.

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