

IMPROVING EFFICIENCY OF HEALTH CARE ORGANIZATIONS USING LEAN CONCEPT

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Abstract: *Lean, as relatively new management concept, surpasses the traditional mass production and creating stockpiles of goods which have to be placed on the market, without analyzing the customers' needs. The focus of lean is on creating the value that customers demand and forming the value streams which contain only processes and activities that generate that value and eliminating all types of wastes and non-value adding activities. Lean concept was founded in Toyota company i.e. in manufacturing system called Toyota production system. Nowadays, this concept has been implemented by many worlds known organizations as the crucial part of their production system, but also other supportive processes in the company. Application of the lean concept can significantly improve process efficiency, lead to drastic cost-reduction, improved quality of the products/services provided, but also can be a main factor of increased employees productivity and resource saving. Profitable and unprofitable health care organizations have determined business strategy and adjusted mission and vision of their path thus, they strive for resource optimization in the process of providing satisfactoral level of service. Accordingly, the examination of possibilities in implementing lean concept in Health Care organizations, as well as analyzing executed techniques and performed activities in leading companies is more than justified. Health Care organizations can be characterized as complex systems with numerous participants and the need for strict coordination of activities in order to provide demanded value for the customers. Monitoring and measuring the performances on various levels and areas of accountability is highly valuable for the Health Care organizations. Regarding that, the subject of this paper will be indicating specifics of measuring the performances in Health Care organizations and possibilities of their improvement.*

Keywords: *Customers, Lean techniques, Process, Value-adding activities, Non-value adding activities, Implementation, Patient, Organization, Value, Value stream, Performance, Employees, Management, Measurement, Waste, Reducing, Continuous, Waiting time*

1. INTRODUCTION

The modern-day changing economic world is throwing new challenges to the managers in forming development strategies, organizational techniques, applying new calculation methods and managing the expenses. To become a leader on the chosen market, the firm needs to adjust its driving policy to the customers wishes and demands, and to do so it must expand its perspective to the outside of its walls. One of the new concepts, which has found its place in numerous world-known corporations, is Lean concept. This concept was founded in Japanese multinational corporation Toyota. With the use of Lean techniques significant improvements in the company were made and the whole Japan's Economy has flourished.

Lean managerial concept enables creating demanded customers value expressed in better quality, product functionality, reduced delivery and waiting time, while maximizing the company's

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value stream profit, reducing supplies inventory and unnecessary waste of resources. Also, from the social aspect, Lean has achieved to increase productivity level as the result of greater satisfaction of the employees.

Wide utilization of the Lean concept in many different areas during the years and its positive outcomes made it interesting for the Health Care institutions. As they have discovered how the implementation of this new managing concept may boost their performances by standardizing complex processes, creating quality time management, conducting and improving activities which generate value, and eliminating those which do not add value and also making a work atmosphere which inspires dedication of their employees, soon the Lean concept was broadly applied in Health care organizations all over the globe.

Regarding that, this article is divided in three parts. In the first part are described the Lean principles in the Health Care institutions. How to measure the performances of one Health Care organization in order to improve its efficiency is shown in the second part. The end of the article focuses on example of exceptional practice in applying Lean concept.

2. LEAN PRINCIPLES IN HEALTH CARE ORGANIZATIONS

When the Lean concept occurred, many looked on it from the manufacturing aspect, neglecting its other possibilities. With the popularization of the concept and its significant outcomes in terms of raising the whole business on a higher level, it became clear that Lean could be applied in each department of the organization and within diverse activities (Maskell, 2018). Lean thinking is not a manufacturing tactic or cost-reduction program, it represents a universal management strategy that can be applied in all types of organizations as a process improving tool and it is known that all organizations- including health care organizations- are composed of series of different processes i.e. set of activities accountable for creating value for those who expect it (customers/patients) (James P. Womack, 2005).

Successful implementation of the lean concept implies on following the main principles that are universal for all types of organizations with additional adjustments for specific activities in a certain organization. Lean principles are promoted as a universal guide to its implementation (Radnor, 2011; Olesen P., 2015; Womack J., 2003).

- 1) *Define value from the customer's perspective.* Value is created by producers or service providers. Value in the company is created if the internal wastes are reduced in terms of activities which do not add value and related expenses, in that case the whole value for the customers increases (Čečević, 2016). If the service providers did not take under consideration the wishes and needs of its consumers in the process of creating value, there would be no consumers for those services. To become a leader on the chosen market, organizations have to stop assessing the internal demands, and start changing their perspective to the outside of its walls. Young and McClean (Young T., 2008) define value from a patient pathway perspective – the route of a patient from entering the hospital to leaving the same, forming a pathway where the value is created on each step, instead of considering only patient-centred activities like: radiology, pathology or some other department as isolated process.
- 2) *Identify the value stream for each product/service provided and design a map of all the necessary steps in those streams.* To identify all value streams, it is necessary conducting the value stream map. The map will show all on-going processes and time and resources

- crucial for their flow. This kind of view can be used for separation of the activities in three groups. These are: activities which add value for the customers, activities which do not add value but it is impossible to exclude them from the regular processes and those activities which do not add value but their elimination is achievable (Schimann & Brewton , 2009). Regarding that, value stream indicates on a set of specific activities which are fundamental in attaining three main business objectives: solving business problems, managing the information and physical transformation (Antić, Stevanović, Novičević Čečević, 2019). For example, one might map the stroke patient pathway to identify value and non-value adding activity. Process start and end points under consideration need to be agreed in advance to keep the improvement focused and manageable; for example, the mapped process might start from stroke onset, hospital journey (ambulance, walk-in patient or GP referral) and the process end-point in an acute care setting context might be patient discharge. In the mapping process have to be included all those who participated in the patient care, from the beginning to the end i.e., those who ‘touched’ the patient (call handler, paramedic, nurse, matron, specialist doctor, departmental manager, etc.).
- 3) *Assure continuous flow in providing services and standardize processes.* After the value and the value streams are identified, all the value adding activities need to be organized in a continuous flow. Impeccable transmission of resources, materials and information is required. Regarding that, Lean management concept has its focus on eliminating all inessential wastes which occur in the value streams. In health care institutions it would mean redesigning processes and erasing all non-value adding activities as waiting on an empty bed, waiting for the doctors’ admission, for the medications etc.
 - 4) *Initiate Pull system.* Pull is triggered by the customers’ demands and aims for establishing the circumstances in which production starts when the external signal is received (Melton, 2005). The goal is reducing as much waste as possible (e.g. waiting) using pull system i.e. pulling patients to the next step on their pathway. That way, operation room personnel can notify the nurse in a certain department to make arrangements in time and provide an empty bed for the patient’s postoperative care. This is how the waste in time of waiting in-between steps of the value chain is reduced.
 - 5) *Strive for perfection (continuous improvement).* Once the value streams are established and their continuous flow guaranteed it doesn’t mean that the lean adjustments are over. Lean signifies continuous improvement in every single department, using variety of lean techniques and methods. Potential of resource saving exists in every area of the organization and each conducted activity and that is the reason why the lean concept is never ending process. It is said that „Lean is not a destination, it is a journey” (Huntzinger , 2007).

In the interest of this paper, the definition of the Lean concept can be concluded: Lean is integrated strategical, operational and social approach of the value system with the main purpose of maximizing value while eliminating all parts of wastes and looking for constant improvement (Joosten , Bongers , & Jansen, 2009).

3. THE MEASUREMENT OF HEALTH CARE PERFORMANCE

The reason why organizations do performance measurement is to analyze their position on the market, relation between competitors and also their own progress or regression in the period. In the most of them performance measurement became the structural part of the business and others do it for the specific purposes. Either way, organizations have to evaluate their performances all the time, so that the actions they take can be estimated. If they know which activities

pull more resources than needed, or take more time than necessary to complete the result, they can redesign the steps, create more efficient transmissions and carry out determined strategy.

Performance measurement is considered to be an efficient instrument in business strategy realization. High-level performance measurement system facilitates evaluation of the key activities and possible improvements. There are different motives for measuring performances of the organization and they can be classified in the following way (Marković , Petković , Trbojević , & Bokonjić, 2013):

- Estimate organization's profitability,
- Evaluate customers' satisfaction,
- Assess the problems and desirable changes,
- Ensure decision making based on facts rather than assumptions,
- Appraise the realization of the planned improvements.

Health care organizations can measure their performances in terms of quality, efficiency and value of the provided services with the utilization of: Financial Performance (FP), Customer Satisfaction (CS) and Employee Performance (EP) (Shazali, Habidin, Khaidir, Jamaludin, & Ali*, 2013).

Financial performance in health care organizations refers to measuring and controlling the expenses. This fulfills one of the main goals- reducing the expenses and increasing the customer satisfaction. Logically, inefficient processes with surplus of non-value adding activities only result in increased expenses. Using lean techniques these expenses can be reduced and that is only possible if the right financial performances are measured continuously.

Patient Satisfaction is providing the evidentiary basis for measuring patient, clinicians and organizational outcomes. The most relevant score about the quality of the provided care is the one the patient gives. Measuring quality of provided services in health care organizations are very complex and it is hard to define it. The appropriate measurement system has not been developed yet. Each one of the stakeholders has a different view of the quality which depends on the needs that have to be satisfied. In the literature three main types of expected patient services are stated (Farid , Nejt , & Mirfakhredini , 2008): desired service, adequate service and regular service. Customers have a level of service they would like to receive and it is called a desired service. There is also a minimal level of service quality- adequate service and the patients are aware that they can't always get an ideal treatment, so they will be satisfied with the adequate service. The third type is a service patient expect to receive- regular service. The great outcome for the patient implies on: impeccable care, better in-bed conditions, availability of the medications, reduced treatment and waiting time.

Employee Performance score depends on working and social conditions of the employees. How one employee feels at work, how he is treated by his colleagues and his superiors, do they respect him, appreciate his devotion and effort. Those could be a relevant factor that affect this performance. Considering that the Lean concept incorporates the human aspect indeed it is suitable for the health care organizations. Investing in employees and their conditions is essential part of the lean philosophy. All of the employees are equally important in accomplishing the lean targets, from support staff, nurses, technicians and doctors to management directors. Success of the organization is the success of all its employees and not just those at the top. Devotion of the employees in implementing determined strategy depends on established business culture and social conditions. If those elements are compatible, the working satisfaction will rise and so will the better business outcomes.

When we talk about improving the health care system it includes an array of tasks which needs to be managed: from patient entry to the exit in the healthcare system. Foley (Foley, 2006) endorses a lean approach in providing healthcare and argues that a lean healthcare transformation cuts across organizational boundaries of departments involved because:

- The aim is to create smooth-flowing consumption streams (patients with needs) matched up with smooth-flowing provision streams (healthcare services).
- The criterion of success is that patients get what they need, where they need it, when they need it, without waiting.
- Consumption and provision streams run across organisational departments.
- Most improvement efforts have been aimed at particularly deficient single points within discrete departments along the stream rather than viewing the whole stream.
- No one tool will help and we may have to invent our own; just start doing something, get it wrong, learn and start again.

Regarding that, goals of applying lean concept would be: improving the quality of products and services, i.e. product or service attributes conform to the expectations and requirements of the consumers, eliminating wastes, i.e. any activity that does not add value in the production process and reduces lead time in the completion of an array of tasks in the process.

Some research shows that health care organizations can not improve their performances only by investing more money or employing more staff and capacity. Real changes come with re-designing process of service providing, e.g. Emergency department can remake its policy of organizing patients in categories, the patients can be separated according to similarity of their value stream (small injuries, serious injuries, resuscitation). Value stream will contain groups of patients which need similar activities in process of providing health care (e.g. routine exams or complex procedures). This type of organizing is distinct from the separation according to clinical image, e.g. chest pain, considering that there could be variety of different approaches to the same clinical state and they have to be adjusted to the particular needs of a patient. Standardizing separate value streams boosted the patient flow and reduced the waiting time in the emergency department (Cookson, Read, Mukherjee, & Cooke, 2011).

4. IMPROVING PERFORMANCE OF HEALTH CARE ORGANIZATION USING LEAN CONCEPT

Many world-known Health Care organizations have already successfully implemented Lean concept in their business and raised their performance on a higher level. One of them is *Hôtel-Dieu Grace* hospital in Ontario (Canada).

With the increasing problems in functioning of the emergency department, which have negatively implied on customers and employee satisfaction, management of the *Hôtel-Dieu Grace* decided to start the lean transformation by building a value stream map (Ng, Vail, Thomas, & Schmidt, 2010). The value stream map of a current state represents the exacts steps in the course of every process providing health care in emergency department, from the registration and admission of a patient until leaving and following control. Every step has participators, process duration time, waiting time based on anterior experience, frequency of repeating steps and accuracy of the data. Also, the map shows information flow, like lab results, diagnostic imaging and development of doctor's consultations. Process duration time and total waiting time, shown on the map, in summary reflect a total lead time. On the value stream map of a current state,

there are 19 steps identified in the process. In order to improve efficiency and productivity of this department, management decided to pay more attention to the following indicators:

- Average admission waiting time (from the registration to entering the doctor's office),
- Average duration time of the visit (from the registration to leaving the emergency department),
- Average duration time of all ED patients visit (including admitted patients),
- Percentage of the patients who have left ED without entering the doctor's office,
- Patients satisfaction level,
- Total number of patients who visited emergency department,
- Number of admitted in-bed patients in ED at 06:00AM.

Process duration time was in the range of 24 to 19 hours, total waiting time from 37 minutes to 57 hours and total lead time from 61 minute to 76 hours. There was only 2% of registered patients who received impeccable care and 40% of patients had to repeat the same steps in the value stream.

Taking under consideration mentioned flaws in the process and identified bottle-necks, the value stream map of the future state sets the total lead time of 215 minutes which has to be achieved in 84% of the cases. Accomplishing predicted lead time means applying appropriate lean techniques, e.g. 5 S, just in time, kaizen, standardization of work etc.

5 S is the simplest lean technique for implementing and the results of it can be seen in a short time. This technique is consisted of following elements:

- Sorting (Sort)- separating necessary from unnecessary,
- Organizing space (Set in order) - organizing work space,
- Cleaning (Shine)- cleaning and moving everything that might get in the way of working,
- Standardizing (Standardize)- implementing procedures and assure that employees understand them,
- Maintenance (Sustain) - secure sustained process flow and constant communication.

Project like reorganization of the medical supplies had positive outcomes. 90% of the most used medical supplies were placed in the steps of the patient's pathway, arrangements with the pharmaceutical companies made possible that procurements arrive just in right amount, on the right place and in the right time (*just in time*), this resulted with reduced stockpiling of materials.

All of the arrived patients were automatically classified in one of the three categories: "admitted", "unspecified" and "discharged". Their charts were instantly placed in the right category (*standardization of work*). Nurses were in charge of organizing patients according to their charts and preparing empty beds in time. Besides that, nurses had all the authorities to conduct necessary procedures of discharging a patient when it is needed and clear the bed for the next arrival. That significantly reduced time of waiting for the patients who were supposed to leave the emergency department and time of waiting for on the empty bed for admitted ones.

Doctors were allowed to prescribe medications and give all the instructions when discharging a patient and to pull IV catheters which also reduced the waiting time. Printing lab results directly in the certain value stream boosted the information flow. This way, increased efficiency of the patient's care was responsible for improved efficiency of the whole emergency department.

Finally, the outcomes of applying the lean concept were better than expected. Patients satisfaction level was notably higher during the first year of implementation of the lean techniques and remained constant in the following period. From the beginning of the lean implementation, in September 2005, average admission waiting time was reduced. From October 2005, to march 2006, the same was reduced on 89 minutes. Average duration time of the visit was 3,3 hours and 5% of patients left ED without entering the doctor's office.

Considering that achieved positive outcomes enhanced the reputation of the health care organization and in the purpose of continuous improvement, *Hôtel-Dieu Grace* hospital pursue with the application of lean principles and techniques. In march 2007, average admission time was 78 minutes, average duration time of the visit 2,8 hours and only 4,3% of patients left the ED without entering the doctor's office. These results prove that lean techniques reduce waiting time significantly. Total number of patients who visited emergency department remain constant during time, on the other hand number of admitted in-bed patients increased. The average number of admitted patients who were waiting for the empty bed in ED at 6:00AM was 1,3 in 2004, 1,8 in 2005, 4,1 in 2006 and 6,1 in the period from January to March 2007.

The key of the lean implementation is involvement of the employees in building a value stream map, giving exact all the necessary information about process flow and on-going procedures in the organization, in giving propositions for the new projects of improving existing bottle-necks and removing wastes. Lean is led by the sentence: "Plan, do, check, react". It is said that lean principles do not give us a solution of the problem, instead they show us how to think about the same.

5. CONCLUSION

The goal and benefit of applying lean in healthcare is reducing waste, as well as reducing waiting time and unnecessary travel, while building quality, speed, and flexibility into the organization. The challenge of applying lean is training the employees to recognize and eliminate wastes in the value stream by observing the whole system, instead of individual tasks in it. Every step in the process is related to the other, so what might seem convenient for one participant may have negative effect on the other. Lean initiative does not focus on large scale investments, but it gives Health Care organizations an alternative methodology for achieving improvement without high investments. Health Care organizations have nine times more non-value adding activities than the ones that fulfill the customer needs. Accordingly, it is estimated that 80% of existing lean techniques can be applied in the Health Care system.

Positive outcomes of implementing lean techniques, such as reduced waiting time, stockpile reduce and eliminated wastes of conducting unnecessary processes are visible in the short-term. Mentioned improvements are the primary goal of lean management concept. If the lean techniques and methods are appropriately implemented, Health Care organization management will be able to analyze the whole process flow and identify value-adding activities which could be done more efficiently and non-value adding activities which need to be eliminated. Removing non-value adding activities and recognized wastes is important part of organization development, because it lowers the expenses and creates more free capacity. In the moment where more capacity is available, management is accountable for utilizing it for generating demanded value. Future, long-term success depends on the way of organizing this capacity.

Implementing lean concept in Health Care organizations will influence the continuous improvement which will lead to increased employee performance as the result of enhanced work satisfaction. Advanced employee performance will have major effect on patients' satisfaction in terms of the quality of received care and treatment. In the end all that reflects on improved financial performance of the organization.

If they wish to accomplish desired performances, Health Care organizations have to begin with the implementation of the lean concept as soon as possible. Especially, since, it is considered that they are approximately at the same level of development as the car industry was in the 80s, which means that the wide specter of techniques, methods and tested practices that can be applied are broadly available nowadays.

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