

Lean thinking in healthcare – review and current situation in Croatia

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ARTICLE INFO

Keywords:

Lean
Healthcare institutions
Improvement
Croatia

ABSTRACT

Lean thinking was first introduced in production (mainly in the automotive) sector but its use has spread into the service sectors. Its benefits are well known worldwide and if implemented and used correctly, companies can improve their effectiveness and gain and/or maintain competitiveness. Recently, lean thinking has started being implemented and used in healthcare to accelerate flow in processes, reduce waste in processes and improve the quality of services for “users”. The main goal of the paper is to provide a literature review on lean thinking in healthcare worldwide. The review is showing the methods and trends in lean healthcare and some of the most successful implementations. Based on the presented worldwide examples, this paper will try to present a potential for the lean implementation in Croatian healthcare institutions and present potential benefits of the application. Based on the research results, this paper gives suggestions for further research on this interesting and important topic.

I. Introduction

An extremely vibrant business environment creates many opportunities for organizations, both in the for-profit and in the non-profit sector, but also challenges that are often unpredictable. Cost minimization, optimal utilization of resources and successful and profitable business are the basic goals of every organization, regardless of the industry sector. Changes in the economy and the establishment of the global marketplace have affected the way companies do business. For many years, the manufacturer’s market, in which the price of selling was the sum of the wanted profit and costs, has been transformed into a customer market by globalization, where profit is the difference between the selling price and the production cost. For organizations to operate successfully in such an environment, they often need to find numerous ways of competing, such as innovation, increased productivity, environmental care, and reduced business costs (Isik et al., 2019). One of the possible approaches is lean thinking methodology. Lean thinking is one of the most up-to-date ways of thinking and working for the whole company. Such a way of thinking and activity uses a variety of models and tools to focus on continuously improving the functioning of the companies with constant perfection. There is a growing research interest associated with the employment of lean thinking for improving the business processes worldwide. Lean thinking, as methodology, uses different tools for implementing a long-term idea aiming for continuous improvement. Its focus is on the elimination of waste perceived by the user/buyer. Thus, the application of lean in the for-profit and non-profit sectors enables businesses or institutions to continuously improve their operations to make it easier to adjust to the changing business ecosystem.

The main goal of this paper is to present the theoretical foundation of the lean thinking methodology, to show the numerous positive aspects of lean thinking in practice and especially in healthcare worldwide. In the empirical part of the paper, we will present an example of lean thinking in two hospitals in the Republic of Croatia. This is important since, in practice, there is still a big misconception that lean thinking can only be implanted in manufacturing organizations. In the final part of the paper, we will present our findings and give proposals for future research.

2. Literature review

Today’s lean thinking methodology is an improved Toyota Production System (TPS), presented by Taiichi Ohno during the 1950s. The TPS was based on the wish to organize production in a continuous flow and did not depend on the long production flows for achieving efficiency (Melton, 2005). The main feature of TPS was the acknowledgement that only a small portion of the overall time and effort put into the production add value to the end-user.

The main principle is to use less of everything (i.e. staff, space, inventory, movements, etc.). then in traditional manufacturing processes although more product variations are produced (Womack, Jones & Roos, 1990). Both methodologies, TPS, and lean thinking have revolutionized the production of the automobiles and now with the use of the *kaizen, poka-yoke, and Kanban*, it is the base of every automobile factory worldwide. In other words, the basis of a lean thinking (production) philosophy is focusing on adding value actions to the end-user, methodical detection and waste elimination, and continuous improvement of the production to increase productivity. Lean thinking is a pool of operating methods and philosophies which help generate maximum value for users by reducing waits and waste (Womack & Fitzpatrick, 1999; Womack & Jones, 2003). It seeks to essentially change the company’s philosophy and value, which finally changes the company’s behavior and culture (Smith et al., 2012). Atkinson (2004) defined lean thinking as a *concept, process and set of tools, techniques, and methodologies that leave behind the success of efficient resource allocation*. This can be driven by the top management of the company or maybe a smaller initiative which is conducted lower in the company. Lean production is one of the projects that big companies which are trying to stay competitive in the global market (Rajenthirakumar & Thyra, 2011) and companies which are implementing lean thinking and/or lean tools are becoming increasingly competitive (Bhasin, 2011).

Slack et al. (2010) state that lean thinking seeks to meet requirements instantly, with flawless quality and without waste. In other words, the flow of products and services always delivers what the customer wants (ideal quality), in exactly the demanded quantity (neither too much nor too little), precisely when it needs to be (neither too early nor too late), precisely where it is needed (not in the wrong location) and at the minimal possible cost. Hopp and Spearman (2004) point out that lean production is an integrated system that ends up producing products and/or services with minimal unnecessary costs. Reid and Sanders (2013) define the lean system as just in time philosophy. Just in time is based on the elimination of loss, that is, the elimination of everything that does not create the extra value for which the customer is prepared to pay. The goal of lean thinking in the first place at its center is to create value for the customer. Žvorc (2013) points out that lean companies focused on:

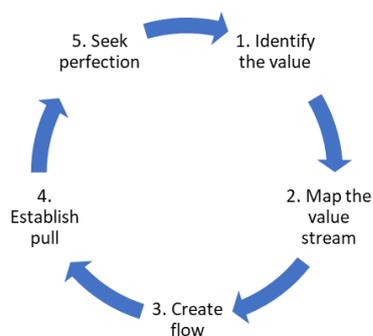
- customers because goals and strategies are outlined based on his / her wishes,
- according to continuous changes and process improvements,
- towards spotting problems and solving them permanently,
- according to innovation,
- shaping the organizational structure determined during customer value,
- according to the standardization of work.

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Received: 03 April 2020; Received in revised from 25 April 2020; Accepted 28 April 2020

To achieve and implement lean thinking, a company must meet the five principles of rational business (value, flow, value flow, retreat, and perfection) defined by Womack and Jones (2003) as follows: a) the end-user is defining the value, b) value flow is a set of specific activities that are required to bring a product through an internal value chain, c) flow refers to the flow of value creation steps, d) withdrawal is scheduled, and 3). Perfection refers to continuous efforts to improve the process. The principles of rational business can also be represented graphically (Figure 1).

Figure 1: Five principles of lean thinking



Source: Karuppan, Dunlap and Waldrum, 2016: 201

The company's transition from "standard" to lean thinking company is never complete. Numerous authors of lean thinking studies and books (Bicheno, 2008; Ohno, 1988; Womack & Jones, 2003) point out that it is an "ongoing journey" rather than a single event with a destination. Therefore, the final step in achieving lean is continuous improvement to achieve perfection. Businesses must constantly evaluate the values they deliver to their customers to improve the process and lower the efforts and time involved, the space used, the number of costs and the number of errors. The goal is to remove the activities that do not add value to the product (service), don't improve value flow or better meet customer demand. Business process improvement is supported by focusing on improvement activities measured by key business performance indicators at the lowest levels and implementing best practices to ensure strategic management goals.

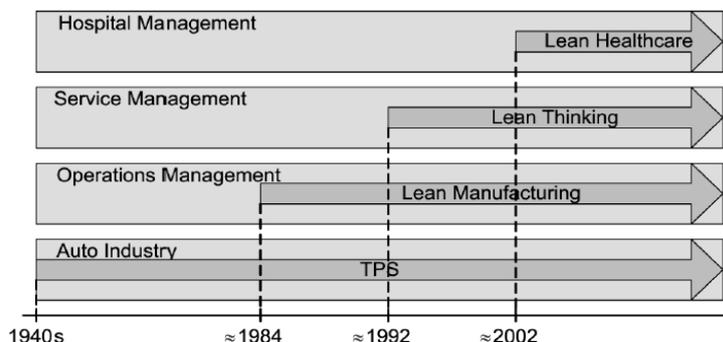
But should lean be implemented only in for-profit organizations? Some studies (Emiliani, 2007; Rivera & Chen, 2007) state that the use of lean is possible in the for-profit and not-for-profit sectors, and the goal is the same – reducing and/or eliminating the activities that do not add value for the final user. Anvari, Ismail and Hojjati (2011) state that, in lean thinking, if the activity does not add value to the customer, then any use of resources is waste. This is supported by other researchers (Pettersen, 2009; Bonavia & Marin, 2006) and by De Toni and Tonchia (1996) who state that preconditions for effective implementation of lean thinking in organizations are increasing employee awareness, top management support, interaction within the organization, close integration and coordination of all activities designed for completing a mutual task. Thus, lean thinking can be implemented in all organizations, for-profit, and not-for-profit, but the application should be tailored to the organization's needs.

3. Lean thinking in healthcare

The significance and applicability of healthcare have developed as a substantial component of the services sector recently. Ebrahimi and Sadeghin (2013) state that increased competitiveness within the health industry became a significant characteristic for healthcare companies to have a competitive advantage. Sunder, Gunesh and Marathe (2018) ranked the healthcare sector as the number one while researching continuous process improvement papers within service sub-sectors. Anthony et al. (2019) state that the health care sector has the highest number of research papers in scientific journals when the topic is in continuous process improvement. Radnor et al. (2012) state that the first implementation of lean thinking was in the UK in 2000, and it was followed by the research in the USA in 2002, and soon after it was globally accepted. The application of lean thinking in the healthcare sector in the United Kingdom was supported by Institution for Innovation and Improvement and NHS Confederation while in the USA, the similar role had Institute for Healthcare Improvement (D'Andreanmatteo, et al., 2015). These two organizations acknowledged the impact of lean thinking in eliminating waste in processes and boosting value, and according to Jones and Mitchel (2006), it was a potential response to the demand for the change recognized in the sector.

Toussaint and Berry (2013) defined lean in the healthcare as *an organization's cultural commitment to applying the scientific method to designing, performing, and continuously improving the work delivered by teams of people, leading to measurably better value for patients and other stakeholders*. Laursen, Gertsen & Johansen (2003) presented the evolution of lean in healthcare (Figure 2). According to their research, there is a delay of 10 years in the application of lean thinking in healthcare concerning other service industries, and Berwick et al. (2005) stated that delivery in the healthcare sector is failing to achieve excellence level as in the manufacturing sector.

Figure 2: Evolution of lean healthcare



Source: Adapted from Laursen, Gertsen and Johansen, 2003

The research about lean thinking in healthcare started in the early 2000s (Thompson, Wolf & Spear, 2003; Young et al., 2004) and soon there were books (Fillingham, 2008; Graban, 2008), excellent and often cited studies (King, Ben-Tovim & Bassham, 2006) and other literature (Womack & Miller, 2005; Jones and Mitchell, 2007) about lean implementation in the healthcare sector. These studies, books and other literature cover different countries, methodologies, topics, and cases of lean thinking in the healthcare sector.

In one of the first lean in the healthcare sector implementation reviews, Mazzocato et al. (2010: 4) looked upon (i) *the methods to understand processes to identify and analyze problems, methods to organize more effective and/or efficient processes, (iii) methods to improve error detection, relay information to problem solvers, and prevent errors from causing harm and (iv) methods to manage change and solve problems with a scientific approach*. Their review showed that healthcare sector used different tools and methods (i.e. value stream mapping, Kanban, 5S, process streaming, etc.) in combination and that they have been used in different settings (i.e. hospital departments, hospital-based pharmacies, non-hospital clinics, etc.) and different healthcare fields (i.e. emergency medicine, surgery, nursing, pathology, etc.). Similar reviews of the lean thinking in healthcare research studies have been done by Brandao de Souza (2009), D'Andreanmatteo et al. (2015), Message Costa and Filho (2016), Antony et al. (2019).

Brandao de Souza (2009) noticed that early attempts of lean thinking implementation in healthcare were transferring manufacturing principles but in later implementations, four types were noted: (i) manufacturing-like studies, (ii) managerial and support case studies, (iii) patient-flow case studies and (iv) organizational case studies. Message Costa and Filho (2016) noted that recent studies of lean thinking in healthcare include lean implementation processes difficulties, basic concepts of lean thinking implementation, evaluation of implementation processes, and advantages of combination with other methods like agile strategy, supply chain innovation, and Sigma. D'Andreanmatteo et al. (2019) in their research proposed several directions for future research on lean thinking in healthcare (Figure 3).

In their research, Antony et al. (2019) concluded that there are still many gaps in the studies about lean healthcare and that they include lack of systematic leanness at organizations level, leanness for organizations learning, the financial side of lean implementation and benchmarks development. Based on their research there are still a lot of open questions regarding lean thinking implementation in the healthcare sector.

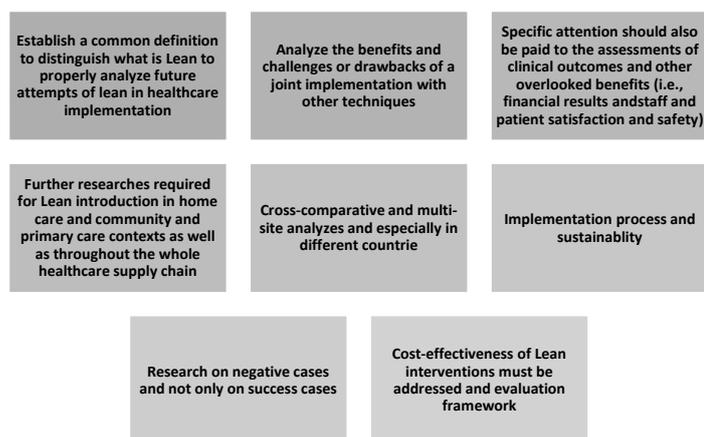
4. Lean thinking in the Croatian healthcare sector

Lean in the healthcare sector in Croatia is still not present in practice, and there are only several research papers about this topic. Žvorc (2013) in his paper researched the potential of implementing lean thinking in non-production companies in Croatia. Štefanić et al. (2015) examined lean management in hospitals and Gudlin et al. (2016) examined the optimization of hospital pharmacies layouts using lean thinking principles.

Besides these three papers, we have found two student graduation theses (Pavlinić, 2017; Zahtila, 2017) on lean thinking in healthcare topics. Based on the found research, we can state that there is a need to introduce the possibility of implementing lean thinking in the Croatian healthcare sector to practitioners but also to academicians.

Thus, we have selected an example of the hospital in Vukovar (Eastern Croatia) to present a lean thinking potential in the Croatian public healthcare sector. The next part of the paper will present a situation in which lean can be useful to improve hospital operations namely its incomes through the establishment of a more adequate billing process.

Figure 3: Future research proposals



Source: Adapted from D'Andreamatteo et al, 2019

4.1. Example from Vukovar Hospital – Improving the process of invoicing

The National Memorial Hospital in Vukovar is an institution that provides healthcare services under the Healthcare Act. It is comprised of hospital services, specialist conciliar healthcare, day hospital, and medication procurement department. For performing the aforementioned services, we are financed from the following sources (Vukovar General County Hospital, 2019):

- contracting and billing healthcare services to insured individuals
- billing healthcare services otherwise than under the contract
- billing healthcare service provided to other healthcare institutions
- contracting and billing fees for services provided to other healthcare institutions
- billing healthcare services to natural and legal persons
- donations from natural and legal persons
- refunds on various claims
- contracted services
- fees for sold goods and admission fees for “Place of Remembrance – Vukovar Hospital 1991” and from product billing – hot meals for employees
- other sources of financing.

Based on what is mentioned above, healthcare is provided to individuals based on (Vukovar General County Hospital, 2019:9): (i) acute care beds – 106, (ii) long-term care beds – 20, (iii) chronic care beds – 5, and (iv) day hospital beds/chairs - 114. The indicated number of contracted beds is at the level of 2018. For the period from January 2019 to October 2019, average hospital stay was reduced from 5.65 to 5.41 days compared to 2018 when the average stay was 6.00 days with a tendency of decreasing, while day hospitals tended to increase in the number of patients (Vukovar General County Hospital, 2019:10). Cumulative income deficit at the National Memorial Hospital in Vukovar entails losses that continue from one year to another, resulting in a negative financial result. Thus, the question is who is in control and which measures are taken to make financial indicators into positive ones. Using a case of palliative care patient and appropriate invoice at the end of treatment, we will see that it is possible to justify contracted beds for chronic patients, 5 of them. According to the International Classification of Diseases, palliative care code is ICD Z51.5. meaning that in that classification, the disease is classified most appropriately for general needs and healthcare assessment (World Health Organization, 2012).

The National Memorial Hospital in Vukovar does not invoice palliative care patients. The hospital financially shows them through acute care and long-term treatment, which in turn results in income deficit. Resources are available, as shown in resource assessment performed in 2014, but individuals still do not comprehend the importance and profitability of billing palliative care. The Croatian Health Insurance Fund (CHIF) pays HRK 550.00 for a single palliative care bed (+ medications, while the price for children is HRK 715.00 + medications per each day of hospital stay) (Croatian Health Insurance Fund, 2019).

Patient V. H. was hospitalized at the Abdominal Surgical Ward with a C25.1 diagnosis (malignant disease of hepatobiliary system and pancreas) from May 25, 2019, to July 12, 2018, a total of 48 days. Invoice for that period, according to the diagnostic-therapy group (DTG) and long-term treatment, amounts to HRK 20,700.00, which the hospital billed to the CHIF (National Memorial Hospital in Vukovar, 2019). In the case billing department has used an improved process of internal invoicing, the hospital could have billed HRK 42,444.12 and simulation of such an invoice clearly shows that the hospital has lost HRK 21,744.12 of potential revenue. According to the author's assessment, the hospital at any point cares for approximately 5 palliative patients, noting that the number of beds contracted with the CHIF is in force since January 1, 2018. Hospitalization of such patients requires correct palliative care invoicing (ICD Z51.5), which in turn results in financial viability.

To highlight the significance of correct invoicing, hospital's senior management needs to be educated on correct invoicing and encourage the work of palliative care team (physicians and nurses), which is competent to declare a patient as palliative patient and to ask patient's family to deliver a red referral slip to the hospital that indicates that the patient is referred to palliative care with palliative care diagnosis.

We believe that if the invoicing department is not formed, the same should be formed from existing human resources, healthcare and non-healthcare employees (educated individuals working in the management) to increase invoicing efficiency and justify monthly limit which should be rationally managed and indicators of that limit should ultimately be positive. This example in National Memorial Hospital Vukovar shows the importance of changing and improving the process of internal invoicing which will remove waste in operations and as a result will create a better result for the organization and in this case, this is increased turn-over.

The lean approach to solving these problems and similar ones considered to be the “waste” of unused potential is to define the root cause of the problem. From what is seen above, it probably lies in the management approach. The lean approach would be more bottom-up oriented and founded on the “Gemba” principle which requires managers to address issues at their origin. Such an approach would imply that staff who identified the problem would be able to suggest its solution. A further step would include the creation of standard operating procedures for the billing process which should define all the necessary steps and rules needed to accomplish adequate invoicing. To make it a sort of “knowledge database”, it should be a part of a “hospital billing manual” and disseminated throughout the system via the internal network, preferably intranet. To make it even more “lean”, visual management rules could be applied in the creation of such a manual. The use of pictograms and diagrams would enable even less adequately trained hospital staff to participate in the process without fear of making crucial mistakes.

4.2. How to be better - proposals for applying lean in Croatian healthcare

The goal of lean thinking in the first place of its center is to create value for the end-user, i.e. the customer. In the case of the healthcare system, the end-user is the patient. Organizations in healthcare systems that have implemented the lean thinking focused on (i) towards patients, (ii) towards process improvements (to reduce waiting time and therefore health system costs) and (iii) towards innovation (more innovation means better quality of service provided to the patient, better efficiency and better cost control). The quality implementation of lean thinking achieves the efficient functioning of the healthcare system, which strikes a balance between needs and expectations of end-users, namely *improving the health status of individuals, families, and society; protecting the population from all health threats; protecting users from the financial consequences of sickness benefits and equitable access of users to all health centers* (Mateljčak & Kekez-Poljak, 2015: 129).

Long waiting lists, unnecessary movement of healthcare personnel, long waiting for a patient to undergo a medical examination, excessive documentation, breakdown of medical equipment and lack of communication are some of the problems that arise in the health care system of the Republic of Croatia, which can be solved by implementing the lean methodology. The primary goal that should be achieved by implementing lean and addressing these issues is to reduce costs in the healthcare system.

The advantages of the lean methodology are that its implementation detects all losses that adversely affect the health system's operations and eliminate them. Lean methodology in the health care system of the Republic of Croatia requires further digitalization of the system which will influence the processes in the health care system. Better digitization of hospitals would reduce waiting lists, eliminate unnecessary writing of the same patient notes on numerous documents (all available in one folder on a computer), better coordination and scheduling of medical staff, which would reduce waiting lists because the doctor was able to handle more patients per day, etc. The lean methodology required and preventive maintenance of medical equipment which reduced the number of medical equipment failures. In his research Pavlinić (2017) examined the triage process in the hospital. The research results showed an increased level of triage process performance in the form of a 63.3% process improvement per average patient, bringing almost three times the time available to a triage nurse or patient processing technician. They proposed the digitization of emergency patient records, which aims to eliminate process losses due to unnecessary waiting and queue creation, as well as to eliminate unnecessary paperwork.

The biggest challenge lean faces in many organizations are the change in a way of thinking necessary for a lean culture to develop and root itself within the organization. It usually starts with the top management who should develop a completely different paradigm to the one it has been used to so far. According to Toussaint and Berry (2013) who described lean as an operating system, lean composed of six essential principles, a culture of respect for the people who do the work is probably the most important principle and the precondition of successful lean implementation. The lean buzzword for such an approach is Gemba and it requires top managers to experience firsthand problems and barriers and thus create and support environment for innovation and continuous improvement which lean is all about.

5. Conclusion

The importance of the lean approach is proved in many different studies around the world and mostly in the production sector. There is a momentum of implementing a lean thinking approach in the service and especially the health sector. Every public healthcare system in the world is constantly under pressure to lower costs while improving quality at the same time. The Croatian one is no exception. Lean, as an innovative approach, has a proven record of success in healthcare organizations worldwide. Its underlying goal of improving value for the client, in this case, the patient, is achieved through constant quality improvements while increasing the efficiency of the organization.

With the implementation of lean thinking in the Croatian healthcare system, the quality of health care delivery would increase, leaving patients more satisfied and less frustrated. The lean environment would provide better service delivery, more satisfied patients, better patient flow through the system, a well-designed pull system, reduce service delivery deficiencies, and keep medical staff more synchronized. Such a lean environment would reduce the losses occurring in the health care system of the Republic of Croatia.

Due to the lack of understanding and implementation of lean thinking in the Croatian health sector, research about this topic would help not only academicians in understanding the principles of lean thinking but practitioners as well. Thus, further research about lean thinking in the Croatian health sector is not only suggested but recommended. Further research about the potential of lean thinking and approach to improving both medical and managerial aspects of the healthcare system in Croatia is suggested based on the examined case because of the importance and the impact it has on social sustainability.

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