

LAPORAN TEKNIKAL

A SYSTEMATIC REVIEW ON LEAN SERVICE AND WASTE IN SERVICE INDUSTRY

NUR NISWAH HASINA MOHAMMAD AMIN

NURFAZIDAH ELIAS

AMELIA NATASYA ABDUL WAHAB

A Systematic Review on Lean Service and Waste in Service Industry

Abstract—Lately, lean has been implemented in service industry and known as Lean Service. However, waste in the services industry is difficult to identify compared to the manufacturing industry. This study seeks to explore the principles of lean service to eliminate wastes. Hence the present article conducted a systematic literature review on lean service. The present review was guided by PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) review protocol. This review selected articles using two main databases, namely Scopus and Web of Science and one additional database, namely Google Scholar. Principles of lean service and waste identified in lean services have been discussed. The results help the people from service industry to understand and identify wastes in lean services more efficiently. This study recommended more studies to review lean in services. Second, identified suitable tools for waste elimination in lean services.

Keywords—lean service, lean thinking, waste

I. INTRODUCTION

The Toyota Production System (TPS) was introduced by Taiichi Ohno and Shigeo Shingo after the World War II. TPS established and defined some principles and management practices to improve the quality of their products, improve productivity, reduce costs, and optimize production and delivery times [1]. TPS is a philosophy, a collection of lean techniques or tools and the concept of waste elimination [2]. The success of the TPS in car industry development shows that the lean techniques are recognized and important [3]. In 1988, Krafcik introduced "Lean" as a term that refers to the TPS [4].

The lean concept was first implemented in the manufacturing industry with a purpose to eliminate waste. Waste was defined as an action in the production process that did not add value to the customer [5]. The lean concept then was successfully implemented in the service industry as well [6]. The objective of implementing lean in the service industry is the same as the manufacturing industry, which is to eliminate waste and increase the efficiency of all resources. Lean service has started to be used in research but still at its early stage. The objective of this paper is to discuss the type of wastes that can be eliminated by proposing the principles of lean.

II. BACKGROUND

At first, lean concept was adopted in Japan to achieve maximum excellence in manufacturing industry, but now lean has been implemented to service industry [7]. Service industry is important as a generator of economic growth [8]. Lean implemented in services to improve the efficiency and quality of services. According to George [9], lean is a principle that speeds up all processes across the company. The implementation of lean provides many

benefits but there is no doubt that service industry confronted many obstacles during the implementation [10].

III. METHOD

A systematic literature review is a way to review existing research in more systematic ways. Although there are many studies that focus on lean implementation, there is still an insufficient amount of reviewing the existing studies on lean in services systematically. A literature review conducted by Bhamu and Sangwan [11] only focused on lean manufacturing. There are some studies that conducted systematic literature review on lean service. Gupta and Sharma [12] conducted a systematic literature review on lean services from 1998 to 2014. This systematic literature review has been conducted from 2010 to August 2020.

A. The review protocol – PRISMA

The review was guided by PRISMA review protocol. PRISMA or Preferred Reporting Items for Systematic reviews and Meta-Analyses is a published standard to conduct a systematic literature review. PRISMA review protocol is used to ensure the author to evaluate the necessary information related to the topic. There are three reported advantages of PRISMA review protocol [13], i) define clear research questions that allow a systematic research, ii) identified inclusion and exclusion criteria, and iii) pursuit to examine many databases of scientific literature in a defined time. The purpose of a systematic review is to minimize bias in finding information. In this study, the reviews were conducted to address this research question, "What are wastes in lean service?".

B. Systematic searching strategies

There are three main processes in the systematic searching strategies process, namely identification, screening, and eligibility as seen in Fig. 1.

a) Identification

Identification is a process to search any synonym, related terms and variation for the main keywords such as lean, lean service and waste. This process provides more options while selecting articles that are suitable for the review. Keywords were identified based on past researches. The review process was conducted on two main databases, namely Scopus and Web of Science. It covers rigorous searching. Both databases covered more than 256 fields of studies including management and computer science studies. Accordingly, search strings on Scopus and Web of Science (WoS) databases were developed in August 2020 after keywords have been determined, shown in Table I. Manual additional search using the same keywords was conducted on another database which is

Google Scholar. The searching process in Scopus, Web of Science and Google Scholar have resulted in a total of 78 articles.

TABLE I: THE SEARCH STRING

Database	Search String
Scopus	TITLE-ABS-KEY (("lean" OR "leanness") AND ("lean service" OR "lean services" OR "lean in service" OR "lean in services") AND ("waste" OR "muda" OR "non-value added" OR "waste elimination"))
WoS	TS = (("lean" OR "leanness") AND ("service" OR "services") AND ("lean service" OR "lean services" OR "lean in service" OR "lean in services") AND ("waste" OR "muda" OR "non-value added" OR "waste elimination"))

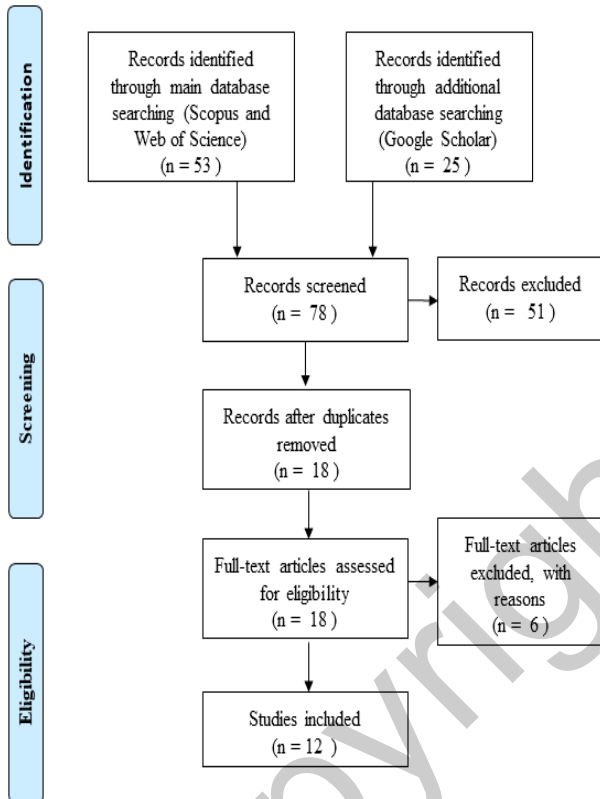


Fig. 1. The Flow Diagram of The Study (Adapted from [14])

b) Screening

This review screened all 78 selected articles by choosing the criteria according to the sorting function available in the databases. The criteria were done automatically based on selected criteria. It is impossible to review all the existing published articles on databases. Okoli [15] mentioned that researchers should figure out the range of period that they able to review. Therefore, the timeline between 2010 and 2020 was determined as one of the inclusion criteria. Next, to ensure the quality of review, only articles published in a journal are included. Furthermore, only articles published in English are assimilated in the review to avoid confusion in understanding while reading the articles. After the inclusion and exclusion criteria shown in Table II are determined, all duplicate articles were removed. The screening process has resulted in a total of 18 articles.

TABLE II: THE INCLUSION AND EXCLUSION CRITERIA

Criteria	Inclusion	Exclusion
Timeline	2010-2020	<2010
Document type	Article journal	Article review, conference proceeding, book, chapters in book
Language	English	Non-English

c) Eligibility

Eligibility is the last process in PRISMA where the author manually selected the remaining articles to be review. A total of 18 articles were prepared during these processes. In this process, all titles, abstracts and the main contents of the 18 articles were inspected. Overall, only 12 selected articles were analyzed after eligibility processes because 6 articles that were not selected did not align with inclusion criteria.

IV. RESULT AND DISCUSSION

The review using PRISMA review protocol managed to obtain 12 selected articles. The systematic literature review has been conducted to answer the research question, "What are wastes in lean service?". In this section, the discussion revolves around principles of lean service and waste in lean service.

A. Principles of lean service

Lean service is a relatively new topic and did not cover deeply in studied [1]. According to Waring and Bishop [16], to reduce waste that adds no value to the product or customer, principles of 'Lean Thinking' are proposed. Lean service is lean thinking's application in service industry. Lean thinking can be described as a management philosophy that increases customers' perceived value by adding desired features and removing wastes in the process. In order to be able to meet the five principles, training for employee to learn skills and knowledge are provided [17]. Lean service principles must be improved [18] and focused on employees.

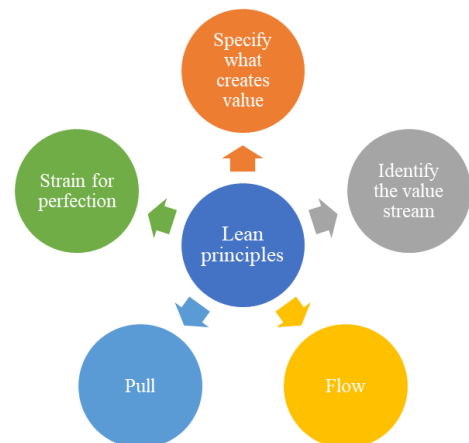


Fig. 2. Principles of Lean Thinking

The application of lean thinking depends on five principles as seen in Fig. 2. Lean principles successfully transformed at several companies which were a non-

production organization [19]. Implementation of lean thinking in the service industry indeed many advantages such as operating costs can be reduced, improved the quality standards of provided services, increased capability of operations, enhanced the business profits, utilized all resources, increased customer's fulfillment, improved employees' achievement and enhanced competitive position [20]. The definition of lean service principles as follows [21]:

- a) *Specify what creates value*: Value can be considered in service environment as the need that the service can cover for the end-customer. Thus, it must be defined by the customer.
- b) *Identify the value stream*: In service, value is primarily created by customer needs, therefore, the stream value is constituted by the activities sequence that enables their satisfaction.
- c) *Flow*: It focuses on the optimization of the continuous movement through the sequence of service activities that generates value, as perceived by the customer.
- d) *Pull*: In a service environment, pull means to distribute the customer demand all along the value stream, delivering only what is actually demanded by the customer.
- e) *Strain for perfection*: Its translation to service must be focused on the customer perspective delivering exactly what the customer wants, exactly when he wants it.

The implementation of lean thinking depends on a severe change from all people in the organizations because it is challenging and requires a powerful investment of time, capital, and effort. According to Leite and Vieira [18] services are considered as center of economic activity as well as mining, agriculture and manufacturing. The principles are appropriated by service organizations in the form of lean service, which supports the customer view [22]. Lean implementation is based on the application of the complete set of lean principles, but not all companies perfect for implementing principles of lean entirely [23].

B. Waste

The objective of lean is to reduce waste. Lean comes from the Toyota Production System introduced by Taiichi Ohno. "Muda" is a Japanese term that means waste. Lean can eliminate wastes that occurs in a work process, repeated mistakes and incorrect procedures [24]. According to Ohno [25], waste is all kinds of production elements that only add cost without adding value to the customer to pay for it. The main challenge in services is the ability to identify waste [21] and waste is something that customers are not willing to pay for [26]. Ohno identified seven types of waste such as transportation, inventory, unnecessary motion, waiting, over processing, over production, and defects for manufacturing industry. Other sources identified additional wastes for lean service [21] which are underutilized resources and manager's resistance to change.

The definition of wastes in lean service as follows[8][20]:

- a) *Over production*: Completion of more work than needed or prior to its being demanded by customer.
- b) *Waiting*: Waiting in terms of employees or customers waiting for information or service delivery.
- c) *Transportation*: This means the movement of unnecessary materials, products or information.
- d) *Over processing*: Adding more value to a service or product than what the customer wants or will pay for.
- e) *Inventory*: Any Work-in-Progress that exceeds what needs to be produced for the customer.
- f) *Motion*: Unnecessary movement of people.
- g) *Defects*: Any aspect of the service that does not suit the needs of the customer.
- h) *Underutilized resources*: Waste of resources, especially human potential, not leveraging employee's talent and potential, under-using their skills, creative abilities and knowledge.
- i) *Manager's resistance to change*: "Saying no" attitude from the management, not encouraging all employees to get involved in the continuous improvement process.

V. CONCLUSION

Service industry can benefit from the application of lean principles through the elimination of wastes. The primary purpose of this study is to review the lean service systematically. Five lean principles are: specify what creates value, identify the value stream, flow, pull and strain for perfection has been identified. Furthermore, the type of waste in lean services is also identified. This review can help the people from service industry understand and identify wastes in lean services more efficiently. This study suggested several recommendations for the consideration of future scholars. First, more studies are needed to review lean in services. Second, identified suitable tools for waste elimination in lean services.

ACKNOWLEDGMENT

We want to express our gratitude to the Universiti Kebangsaan Malaysia for the research grants, Code: GGPM-2019-065, which enabled us to develop this research..

REFERENCES

- [1] M. F. Morales-Contreras, M. F. Suárez-Barraza, and M. Leporati, "Identifying Muda in a fast food service process in Spain," *Int. J. Qual. Serv. Sci.*, vol. 12, no. 2, pp. 201–226, 2020.
- [2] A. N. Abdul Wahab, M. Mukhtar, and R. Sulaiman, "Lean Production System Definition from the Perspective of Malaysian Industry," *Asia-Pacific J. Inf. Technol. Multimed.*, vol. 6, no. 1, pp. 1–11, 2017.
- [3] A. N. Abdul Wahab, M. Mukhtar, R. Sulaiman, and K. Shafinah, "Validating the Relationship Between Lean Dimensions and Wastes: A Pilot Study of Malaysian Industries," *Int. J. Eng. Sci. Res. Technol.*, vol. 6, no. 7, pp. 366–375, 2017.
- [4] J. F. Krafcik, "Triumph of the lean production system," *Sloan Manage. Rev.*, vol. 30, no. 1, p. 41, 1988.

- [5] J. P. Womack, D. T. Jones, and D. Roos., *The machine that changed the world*. Macmillan Publishing Company. Simon and Schuster, 1990.
- [6] W. Chen, "Research and Application of Civil Aviation Ground Service Management based on Lean Management," *Atl. Press*, vol. 68, pp. 422–427, 2018.
- [7] R. Abdul Hamid and I. R. Ismail, "Faktor Kejayaan Pemikiran Lean dan Pencapaian Operasi di Sektor Perkhidmatan," *J. Pengur.*, vol. 47, pp. 143–155, 2016.
- [8] H. S. Abu Hasim, P. B. Tin, and Z. Darawi, "Analisis keperluan tenaga manusia dalam industri Perkhidmatan di Malaysia," in *Malaysian Journal of Mathematical Sciences*, 2012, vol. 9, no. 1, pp. 993–1000.
- [9] M. L. George, *Lean Six Sigma for Service: How to Use Lean Speed and Six Sigma Quality to Improve Services and Transactions*. 2003.
- [10] M. Alsmadi, A. Almani, and R. Jerisat, "A comparative analysis of Lean practices and performance in the UK manufacturing and service sector firms," *Total Qual. Manag. Bus. Excell.*, vol. 23, no. 3–4, pp. 381–396, 2012.
- [11] J. Bhamu and K. S. Sangwan, "Lean manufacturing: Literature review and research issues," *Int. J. Oper. Prod. Manag.*, vol. 34, no. 7, pp. 876–940, 2014.
- [12] S. Gupta and M. Sharma, "Lean services : a systematic review," no. November 2017, 2016.
- [13] P. C. Sierra-Correa and J. R. Cantera Kintz, "Ecosystem-based adaptation for improving coastal planning for sea-level rise: A systematic review for mangrove coasts," *Mar. Policy*, vol. 51, pp. 385–393, 2015.
- [14] M. D. L. A, T. J, and A. DG, "The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement," 2009.
- [15] C. Okoli, "A guide to conducting a standalone systematic literature review," *Commun. Assoc. Inf. Syst.*, vol. 37, no. 1, pp. 879–910, 2015.
- [16] J. J. Waring and S. Bishop, "Lean healthcare: Rhetoric, ritual and resistance," *Soc. Sci. Med.*, vol. 71, no. 7, pp. 1332–1340, 2010.
- [17] R. Abdul Hamid, M. D. Ismail, and I. R. Ismail, "Importance of Employee Participation in Lean Thinking and Their Competency Towards Employee Innovative Behaviour," *South East Asian J. Manag.*, vol. 14, no. 1, pp. 23–43, 2020.
- [18] H. dos R. Leite and G. E. Vieira, "Lean philosophy and its applications in the service industry: A review of the current knowledge," *Production*, vol. 25, no. 3, pp. 529–541, 2015.
- [19] I. Tomašević and D. Slović, "Facilitating wasteful activities discovery in pure service environment through usage of process mining," *Int. J. Ind. Eng. Manag.*, vol. 4, no. 4, pp. 199–206, 2013.
- [20] A. A. A. Mohammad, "Approaching the adoption of lean thinking principles in food operations in hotels in Egypt," *Tour. Rev. Int.*, vol. 21, no. 4, pp. 365–378, 2017.
- [21] E. Andrés-López, I. González-Requena, and A. Sanz-Lobera, "Lean Service: Reassessment of Lean Manufacturing for Service Activities," *Procedia Eng.*, vol. 132, pp. 23–30, 2015.
- [22] K. Lisiecka and I. Burka, "Lean service implementation success factors in polish district heating companies," *Qual. Innov. Prosper.*, vol. 20, no. 1, pp. 72–94, 2016.
- [23] M. Z. Rafique, M. N. Ab Rahman, N. Saibani, N. Arsad, and W. Saadat, "RFID impacts on barriers affecting lean manufacturing," *Ind. Manag. Data Syst.*, vol. 116, no. 8, pp. 1585–1616, 2016.
- [24] Y. Putra and M. M. Yusof, "A review of technology-induced error and waste in medication reconciliation," *Proc. - 5th Int. Conf. Electr. Eng. Informatics Bridg. Knowl. between Acad. Ind. Community, ICEEI 2015*, pp. 716–719, 2015.
- [25] T. Ohno, *Toyota Production System: Beyond Large-Scale Production*. New York: Productivity Press, 1988.
- [26] A. Agus and M. S. Hajinoor, "Lean production supply chain management as driver towards enhancing product quality and business performance: Case study of manufacturing companies in Malaysia," *Int. J. Qual. Reliab. Manag.*, vol. 29, no. 1, pp. 92–121, 2012.