669

Int. J Sup. Chain. Mgt   Vol. 7, No. 6, December 2018

Value Stream Mapping and Warehouse Performance among Malaysian Manufacturing Industry

Mohd Fadzil Harun[#1], Nurul Fadly Habidin[2], Nor Azrin Md Latip[3]

[#1, 2, 3]*Department of Management and Leadership,*
Universiti Pendidikan Sultan Idris,
35900 Tanjung Malim, Perak, Malaysia
[1]`fadzilharun2014@gmail.com`
[2]`fadly@fpe.upsi.edu.my`
[3]`nor.azrin@fpe.upsi.edu.my`

Abstract— **The purpose of this study is to determine the relationship between value stream mapping and warehouse performance among Malaysian manufacturing industry. The population of the Malaysian manufacturing industry comprised 2,700 manufacturing companies using a questionnaires survey. Structural equation modeling is a statistical modeling tool used in the study. The implementation of value stream mapping might become business strategy to the organization, particularly among Malaysian manufacturing industry. Thus, the implication of this study is seen as important and useful in increasing knowledge to determine value stream mapping initiatives are important to improve warehouse performance among Malaysian manufacturing industry.**

Keywords— *Value stream mapping, warehouse performance, manufacturing industry, Malaysia*

1.   Introduction

One of the popular concepts that have been widely used for improvements in the manufacturing sector over the last ten years is lean. It is known as approach for industrial improvement that originating from the Toyota production system. Based on study from [1] lean is a multi-dimensional approach combine several of management practices into a smooth system that produces products at the step of customer demand by reduces operational cost and limiting waste. Through this concept has been extensively used in the manufacturing sector, its application in warehouses is still lagging behind [2]. Thus, to fill the literature gap of lean in warehouse this study will focus on the relationship of Value Stream

Mapping (VSM) and Warehouse Performance (WP) among Malaysian manufacturing industry.

Additionally, this study also proposed to include VSM and WP. VSM is another concept of lean that are able to visualize the flow of material and information in a process and it is a concept commonly used for industrial improvements. It can be used to identify where value is added to the product and when wastes occur. There is a potential to apply VSM to a warehouse [3]. However, study by [2] mentioned that it is important to understand waste in order to interpret the VSM.

WP is measure used to assess the performance among Malaysian manufacturing industry. This construct involve two dimension which are, financial performance and non-financial performance in order to evaluate warehouse operational in term of waste reduction and cost reduction. This study aims to determine the relationship between VSM and WP among Malaysian manufacturing industry.

The objective of this research is to determine the relationship between VSM and WP among Malaysian manufacturing industry. The objective of the research is as following:
    1. To determine the relationship between VSM and WP among Malaysian manufacturing industry.

2.   Literature Review

Value stream mapping (VSM) is approach that assist organization in determine which steps in operational process are value adding or not value adding. It visualizes the process of whole operational by using flow chart by help from symbols, metrics, and arrows [4]. The flowchart can support warehouse in tracking the performance of the whole process in managing warehouse. Literature reveals that VSM often used by lean practitioners to identify major sources of non-value-added time in a value stream [5]. Traditionally, it is also used to envision a less-

670

Int. J Sup. Chain. Mgt
Vol. 7, No. 6, December 2018

wasteful future state to identify wastes and develop an implementation plan for future lean activities. This is important as [6] mentioned that 5S lean tool is practice that need self-discipline and suggest to be integrated with a management system. To address this issue, VSM will be applied in this study to study the relationship with WP among Malaysian manufacturing industry.

Although lean tools were often combined, the observed changes of thies intervention in the previous literature show the result of improved working processes, waste reduction and financial saving for warehouse management [7]. Hence, by applied VSM in this study might as well provide a structured method for Lean opportunities in warehouse management.

The benefits of VSM are important to the supplier of electronic, electrical, and mechanical components. VSM approach can be improving productivity and quality, particularly among Malaysian manufacturing industry. Table 1 shows the benefits of VSM.

Table 1. Benefits of VSM

Benefits of VSM	Authors
Improve the process, reduce waste, and enhance resource utilization.	[8]
Improve cycle time, improve production lead time, and increase inventory management.	[9]
Improve value-adding activities, elimination of waste, improve the flow of materials, continuous improvement, enhance process improvement, information flow, improve quality management, and cost reduction.	[10]
Cost reduction, improve machinery use, employees' improvement, improvement in stock, and increase the production flow.	[11]
Improve production process, customer relations, selection of suppliers, enhance productivity, continuous improvement, improve product quality, and delivery on-time to customers.	[12]
Improve production process, improve material and information flows, reduce the lead time, efficiency of resources, and enhance labor productivity.	[3]

Warehouse performance (WP) is related to the warehouse management of the company. It is the control of the warehouse based on the objectives, policies, and goals. In short, WP is the measurement of performance that might enable warehouse changes by reporting and validating the impact and benefits of the changing processes [13]. WP will be conducted through follow-up of performance indicators, which would reflect the relationship between VSM towards improvement of warehouse. WP will provide reporting to make decisions on the warehouse operational process that involves waste disposal and value added process.

The complexity of a warehouse operation has a large impact on the performance of the warehouse. Thus, this highlights that by simplify the warehouse operation can directly affect WP [14]. In this study, researcher proposed approach like VSM and WP among Malaysian manufacturing industry to help warehouse management in improving efficient and effectiveness of warehouse process by minimize waste and add value.

2.1 VSM dimensions

In the case of VSM, it is a lean approach that visually identifies and measures waste resulting from the inefficiencies, unreliability and/or incapability of information, time, money, space, people, machines, material and tools during the transformation process of a product [15]. The current and future value stream maps as the most commonly used tools employed during a VSM analysis. In this study, researcher proposed current state map and future state map.

2.1.1 Current state map (CSM)

Current State Map (CSM) is the baseline view of the existing process from which all improvements are measured [15]. CSM use icons to represents all entities and operations in the value chain. It is a snapshot in time of how the value stream was actually operating. The initial step of CSM is to gather data that reflects the current status in the system and in this case warehouse among Malaysian manufacturing industry.

2.1.2 Future state map (FSM)

The Future State Map (FSM) represents the vision of how the project team sees the value stream at a point in the future after the improvements have been made [12]. The concern is on mapping the future state with identification of the opportunities to design a more efficient and waste-free value stream. After carefully analyzing warehouse at micro level and observing the past data concerning major losses, some improvement proposals have been derived. This improvement proposal is incorporated and the performance measures are

estimated. FSM was developed using the same procedure as CSM.

2.2   WP dimensions

2.2.1   Financial performance (FP)

Regarding financial performance (FP) measures, effective WP can contribute to improve FP through the creation, development, or management that provides important resources to the companies. FP can be measured on reduce production costs, reduce inventory, enhance resources utilization, and equipment utilization [16]. FP can increase the profitability, increase revenues, and reduce cost in order to improve the performance among Malaysian manufacturing industry.

In WP, FP is a key aspect of performance and company growth [17]. This is because WP contribute to financial and growth to improve the FP in the organization. FP is to reduce cost, increase revenue growth, and improve the company's value of the organization [18]. In this context, FP is important to the WP for improving the financial growth of the organization, particularly among Malaysian manufacturing industry.

2.2.2   Non-financial performance (NP)

Non-financial performance (NP) measures such as customer satisfaction, employee involvement, product quality, competitive force, and amount of goods delivered on time. NP is significant to the organizations such as improve cycle-time, increase customer satisfaction, employee satisfaction, and product quality. Furthermore, NP measures are important in WP, especially among Malaysian manufacturing industry.

NP includes employee involvement, customer satisfaction and retention, teamwork, and product quality [19]. Importantly, NP has been found to increase customer satisfaction, employee satisfaction, cycle time, delivery time, and quality of product. As a result, companies can include NP measures for the WP to assist managers with the appropriate information about the overall company. Thus, WP can be measured FP and NP for improving the performance, particularly among Malaysian manufacturing industry.

2.3   The relationship between VSM and WP

VSM provides the impact on value stream of warehousing aspects in order to enhance the performance. [12] highlighted that the uniqueness of the application of VSM, improve the performance. For instance, VSM provides

warehouse benefits to assist companies in accordance with warehouse value stream [14]. By adopting VSM and WP for warehouse, the companies have possibility of increasing value added process and thus improve the quality of warehouse management.

VSM are closely related to warehouse approach. Study by [20] highlight that by implication, VSM can be extended to and sustained by visually managing the results of the performance towards the goal. This suggests that VSM in assisting the company to identify organizational management. As VSM are needed to provide the information of warehouse for WP. VSM can enhance visual management of warehouse [21]. Therefore, VSM and WP can lead to better competitive advantage to increase the performance. The adoption of VSM provides positive with value stream to remove non-value stream and improve WP. Thus, VSM is a positive relationship with WP, particularly among Malaysian manufacturing industry.

Based on previous studies, H_1 was proposed as it has been shown that VSM has positive impact on WP. The following H_1 are proposed as below:

H_1: There is a positive and significant relationship between VSM and WP among Malaysian manufacturing industry.

To understand the relationship between VSM and WP among Malaysian manufacturing industry, the following hypotheses will be tested. Figure 1 shows the research framework of VSM and WP.
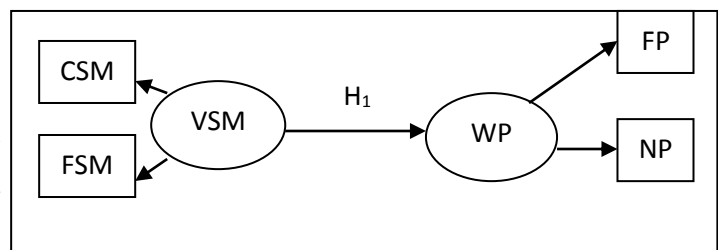
*Notes: VSM= Value Stream Mapping, CSM= Current State Map, FSM= Future State Map, WP= Warehouse Performance, FP= Financial Performance, NFP= Non-Financial Performance

Figure 1. The proposed research model

From the above proposed research model, this study has one independent variable which is VSM (current state map and future state map) and one dependent variable of WP (financial performance and non-financial performance).

VSM have increased WP in order to improve the performance. The implementation of VSM provides positive to improve WP [22]. Besides, VSM can positively towards minimize waste; add value, and natural opportunities for the integration

672

Int. J Sup. Chain. Mgt   Vol. 7, No. 6, December 2018

of lean. VSM is to improve warehouse management efficiently and effectively. However, there is a lack of studies on the implementation of VSM and WP among Malaysian manufacturing industry. Therefore, the implementation of VSM and WP can improve warehouse in order to succeed and sustain the quality management among Malaysian manufacturing industry.

3.   Methodology

In this study, the survey instrument was analyzed using two packages statistical software. Firstly, the Statistical Package for Social Sciences (SPSS) software for window Version 21.0 will be used to perform the required statistical analysis of the data from surveys and Structural Equation Modelling (SEM) technique Version 21.0 will also be used afterward. SPSS will be used to conduct descriptive analysis, validity, and reliability analysis will be used to assess the compatibility of the proposed model with the observable data [23].

SEM is a statistical modeling tool used in the study [24]. SEM is used to describe a large number of statistical models to assess the validity of the theory with empirical data [25]. SEM takes a confirmatory (hypothesis testing) approach to the multivariate analysis of a structural analysis.

The population focused on the manufacturing industry. The population of the Malaysian manufacturing industry comprised 2,700 manufacturing companies from Federation of Malaysian Manufacturers Directory using a questionnaire survey.

Besides, SEM with latent variables provided by researchers to build, tests, and modifies the theory in order to develop a method of analysis [26]. Thereby, it is a comprehensive approach to test the hypothesis of the relationship between the latent variables. Therefore, SEM application, a general rule of thumb is the minimum sample size should be no less than 200 (preferably no less than 400 especially when observed variables are not multivariate normally distributed) [27, 28].

4.   Conclusions

The implementation of VSM might become business strategy to the organization, particularly among Malaysian manufacturing industry. Manufacturing industry is also more competitive by reducing in waste and VSM practices enrichment. This study also provides new perspective to the innovation development of VSM initiative in different ways by using continuous improvement in warehouse research.

Thus, the implication of this study is seen as important and useful in increasing knowledge to determine VSM initiatives are important to

improve WP. The findings of this study may indicate the relationship between VSM and WP among Malaysian manufacturing industry. Finally, it can be provided as a guideline and reference for the manufacturing practitioners and academicians.

Acknowledgments

References

[1] Habidin, N.F., "*Structural analysis and tool for lean sis sigma, strategic control system and organizational performance*", PhD thesis, Universiti Teknologi Malaysia, 2012.

[2] Wessman, I., Bärring, M., "*Analysing the current state of a warehouse*", Master thesis, Lund University, Italy, 2014.

[3] Aziz, Z., Qasim, R.M., Wajdi, S, "*Improving productivity of road surfacing operations using value stream mapping and discrete event simulation*", Construction Innovation, Vol. 17, No. 3, pp. 294-323, 2017.

[4] Pai, P.M., "*An analysis of the integration of lean and safety*", Master thesis, Missouri University of Science and Technology, United States, 2010.

[5] Dotoli, M., Petruzzelli, G., Turchiano, B., "*A lean warehousing approach using unified modelling language and value stream mapping: A case study*", In 9th International Conference of Modelling, Optimization and Simulation, June (06-08), 2012.

[6] Gupta, S., Jain, S.K., "*An application of 5S concept to organize the workplace at a scientific instruments manufacturing company*", International Journal of Lean Six Sigm*a*, Vol. 6, No. 1, pp. 73-88, 2015.

[7] Walker, E.W., "*5S implementation plan for the shipping Department at Helical Products Co*", Master thesis, California Polytechnic State University, 2011.

[8] Xie, Y., Peng, Q., "*Integration of value stream mapping and agent-based modeling for OR improvement*", Business Process Management Journal, Vol. 18, No. 4, pp. 585-599, 2012.

[9] Singh, H., Singh, A., "*Application of lean manufacturing using value stream mapping in an auto-parts manufacturing unit*", Journal of Advances in Management Research, Vol. 10, No. 1, pp. 72-84, 2013.

[10] Forno, A.J.D., Pereira, F.A., Forcellini, F.A., Kipper, L.M., "*Value stream mapping: A study about the problems and challenges found in the literature from the past 15 years about application of lean tools*", The International Journal of Advanced Manufacturing Technology, Vol. 72, No. 5-8, pp. 779–790, 2014.

[11] Librelato, T.P., Lacerda, D.P., Rodrigues, L.H., Veit, D.R., "*A process improvement approach based on the value stream mapping and the theory of constraints thinking process*", Business Process Management Journal, Vol. 20, No. 6, pp. 922-949, 2014.

[12] Suarez-Barraza, M.F., Miguel-Davila, J., Vasquez-García, F., "*Supply chain value stream mapping: A new tool of operation management*", International Journal of Quality & Reliability Management, Vol. 33, No. 4, pp. 518-534, 2016.

[13] Lao, S.I., Choy, K.L., Ho, G.T.S., Tsim, Y.C., Lee, C.K.H., "*Real-time inbound decision support system for enhancing the performance of a food warehouse*", Journal of Manufacturing Technology Management, Vol. 22, No. 8, pp. 1014-1031, 2011.

[14] Kembro, J.H., Danielsson, V., Smajli, G., "*Network video technology: Exploring an innovative approach to improving warehouse operations*", International Journal of Physical Distribution & Logistics Management, Vol. 47, No. 7, pp. 623-645.

[15] Vinodh, S., Selvaraj, T., Chintha, S.K., Vimal, K.E.K., "*Development of value stream map for an Indian automotive components manufacturing organization*", Journal of Engineering, Design and Technology, Vol. 13, No. 3, pp. 380-399, 2015.

[16] Habidin, N.F., Hibadullah, S.N., Fuzi, N.M., Salleh, M.I., Latip, N.A.M., "*Lean manufacturing practices, ISO 14001, and environmental performance in Malaysian automotive suppliers*", International Journal of Management Science and Engineering Management, Vol. 13, No. 1, pp. 45-53, 2017.

[17] Akhtar, P., Fischer, C., "*Supervision environments and performance of UK dairy warehouses: A path analysis*", British Food Journal, Vol. 116, No. 6, pp. 1000-1013, 2014.

[18] Habidin, N.F., Hudin, N.S., Mustaffa, W.S.W., Zainol, Z., Ong, S.Y.Y., Fuzi, N.M., "*A proposed tool for lean healthcare performance improvement (LHPI)*", International Journal of Academic Research in Business and Social Sciences, Vol. 7, No. 6, pp. 1131-1141, 2017.

[19] Simon, A., Bartle, C., Stockport, G., Smith, B., Klobas, J.E., Sohal, A., "*Business leaders' views on the importance of strategic and dynamic capabilities for successful financial and non-financial business performance*", International Journal of Productivity and Performance Management, Vol. 64, No. 7, pp. 908-931, 2015.

[20] Mustafa, M.S., "*A theoretical model of lean warehousing*", PhD thesis, Politecnico di Torino, Italy, 2015.

[21] Gergova, I., "*Warehouse improvement with lean 5S: A case study of Ulstein Verft AS*", Journal of Business Strategy, Vol. 29, No. 1, pp. 40-45, 2010.

[22] Srinivasan, S., Ikuma, L.H., Shakouri, M., Nahmens, I., Harvey, C., "*5S impact on safety climate of manufacturing workers*", Journal of Manufacturing Technology Management, Vol. 27, No. 3, pp. 364-378, 2016.

[23] Lei, P., Wu, Q., "*Introduction to structural equation modeling: Issues and practical considerations*", Educational Measurement: Issues and Practice, Vol. 1, No. 1, pp. 33-43, 2007.

[24] Habidin, N.F., Salleh, M.I., Latip, N.A.M., Azman, M.N.A, Fuzi, N.M., "*The development of strategic balanced scorecard tool (SBST) for Malaysian automotive industry*", Journal of Industrial and Production Engineering, Vol. 33, No. 4, pp. 271-285, 2016.

[25] Koubaa, Y., Tabbane, R.S., Jallouli, R.C., "*On the use of structural equation modeling in marketing image research*", Asia Pacific Journal of Marketing and Logistics, Vol. 26, No. 2, pp. 315-338.

[26] Habidin, N.F., Yusof, S.M., Fuzi, N.M., "*Lean six sigma, strategic control systems, and organizational performance for automotive suppliers*", International Journal of Lean Six Sigma, Vol. 7, No. 2, pp. 110-135, 2016.

[27] Haidari, S., Samani, S., Sohrabi, N., "*Confirmatory factor analysis on multidimensional adjustment scale*", Procedia-Social and Behavioral Sciences, Vol. 217, No. 2, pp. 1199-1202, 2016.

[28] Habidin, N.F., Salleh, M.I., Latip, N.A.M, Azman, M.N.A., Fuzi, N.M., "*Lean six sigma performance improvement tool for automotive suppliers*", Journal of Industrial and Production Engineering, Vol. 33, No. 4, pp. 215-235, 2016.