# Comparative Study of Lean Practices between Japanese and Malaysia Automotive Service Centres: A Survey Result

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***Abstract*— Lean practices is not only a business philosophy but also a management tool which has recognised highly benefits to decrease costs, remove waste, increase productivity and improve quality and profit. Nowadays, lean practices are implemented in many manufacturing and services companies. Lean practices are implemented in order to minimize wastes while maximise the overall performances in an organisation. In service sector, lean practices are importance to ensure value added services can be delivered to customers. However, Malaysia automotive companies cannot compete with Japanese automotive companies in terms of their customer satisfaction. The purpose of this study is to compare the lean practice between Japanese and Malaysia automotive service centres. A total of 80 questionnaires out of 100 distributed questionnaires were responded and this represented as 80% of response rate. The Mann-Whitney test result shows that there were four out of five factors of lean practices have significant differences between Japanese and Malaysia automotive service centres, which are TPM, JIT, Kanban, and 5S. VSM has not significant difference between ownerships. In addition, TPM, JIT, Kanban, VSM and 5S were higher practices in Japanese companies against Malaysia companies. Many Malaysia companies are still in the journey of lean practices and they need recommendation guidance to compete with other long-term established companies. Based on the survey result, the significant differences are identified as weak points of Malaysia companies as an opportunity to improve. Moreover, the significance of this study can help researchers and industry players to improve lean practices in automotive service industry.**

***Keywords*—** *Total Quality Management, Automotive Industry, Lean practices, Survey, TQM*

## 1. Introduction

Nowadays, Malaysia automotive industry is one of the most important ideal and strategic industry involving in the design, development and manufacturing, marketing, and selling of motor vehicles. Automotive industry is one of the world's most important economic sectors [1][2][3]. In addition, Malaysian automotive industry has been identified to boost industrialization process for manufacturing sector in order to achieve vision 2020. 591,598 passenger cars were sold in Malaysia in 2015, which is the highest number ever within 16 years [4]. This higher number sales was influenced by Malaysian customer buying power [4]. Besides, National Automotive Policy (NAP) has introduced to facilitate the information and optimal integration of local automotive industry into regional and global industry network in liberalized and competitive global environment. Thus, in order to support the NAP achieving and obtaining the objectives, development of high value manufacturing activities is important [5][6]. One of the objectives of NAP is to ensure organised development in long term competitiveness and capability of the domestic automotive industry as a result of market liberalization. Moreover, although Malaysia is an industrial country, but in order to compete and exist in the globalization market,

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implementing lean practices (LP) practices can help the industry to gain the benefits while eliminating waste in operation and production activities such as reduce leading time, reduce defects and thus increasing product quality and excellent service for customers' responsiveness [7][8].

Now, LP is widespread accepted and grow development in manufacturing practices across both countries and industries [9][10]. The core and main idea of LP is based on waste reduction. LP works on minimizing and eliminating wastes from the manufacturing process. LP started at Toyota with names such as Just in time (JIT) manufacturing or Toyota Production System called TPS [11]. Moreover, another way to look at LP is based on tools, and techniques which have been proven effective for driving wastes out from the manufacturing process [12][13]. Thus, lean means manufacturing without wastes [14]. Waste is anything non-value activity that incurred in the manufacturing and operations process [15]. Seven types of wastes are overproduction, work-in-process waiting time, transportation, waste of motion, over-processing, waste of inventory, and waste from product defects [16][17]. Based on the Table 1, there are five main factors of lean practices from seven lean practices which are: (1) Total productive maintenance (TPM); (2) Just in time (JIT); (3) Kanban; (4) Value stream mapping; (5) 5S. TPM is consider as a comprehensive method on equipment maintenance to attain the perfection in production such as no breakdown, zero defects, no small stops and slow running process, and no accidents in working environment [18]. JIT is a tool for continuous production flow with zero inventories and seeks for eliminating and minimizing inventory from raw material stock to finished goods stock [19]. Kanban is an information system that is used to manage and control the number of parts to be produced in every process [20]. Value stream mapping is a flow chart that usually uses symbols that know as the "language of lean" to show and improve flow of inventory and information [21]. 5S is a workplace organisation that approach that use five Japanese words which are Seiri, Seiton, Seiso, Seiketsu, and Shitsuke [22].

**Table 1:** Lean Factors

| **Authors** | Biggs (2009) | Puvanasvaran et al. (2009) | Nordin *et al.* (2010) | Shah and Ward (2007) | Mackelprang and Nair (2010) | Wong *et al.* (2009) | Singh et al. (2010) | Crabke (2007) | **Frequency** | **Rank** |
|---|---|---|---|---|---|---|---|---|---|---|
| **5S** | √ | √ | √ | | | √ | | √ | **5** | **4** |
| **Kanban** | √ | √ | √ | √ | √ | √ | | √ | **7** | **1** |
| **Set up reduction** | | | √ | √ | √ | | | √ | **4** | **7** |
| **VSM** | √ | √ | | | | √ | √ | √ | **5** | **4** |
| **Lot size reduction** | √ | | √ | √ | √ | | | √ | **5** | **4** |
| **JIT** | √ | √ | √ | √ | √ | √ | | √ | **7** | **1** |
| **TPM** | √ | √ | √ | √ | √ | √ | | √ | **7** | **1** |

In addition, lean practices help to examine business processes and focus on minimizing unnecessary costs, eliminating waste and while improving inefficient procedures [23][24][25]. Benefits of using lean principles are identifying problem areas and bottlenecks, simplifying operation process, and increasing business efficiencies by ensuring staffs' time is spent on the value-added activities [26]. Hence, manufacturing industries must adopt LP in order to face the challenges in the future.

The objectives of this study are:

1. To compare the Lean practice between Japanese and Malaysia automotive service centre.
2. To identify the relationship between Lean practice and business sustainable in automotive service centre.

## 2. Methodology

The objective of this research is to compare LP between Japanese and Malaysia companies in the automotive service centres. A survey instrument

was developed with five constructs of critical success factors (CSFs) were proposed which were felt important for LP implementation. For the purpose of scoring LP, a seven-point Likert scale was employed with 1 meaning 'not important' and 7 meaning 'very important'. A 'moderate' level is indicated as 4. When the questionnaire had been validated by quality experts, it was pilot tested and finalised. A sample of 100 companies, Japanese and Malaysia, was selected. At the end of February, 85 questionnaires were returned which represented 80.0% response rate. The number of returned questionnaires that were found to be usable in this study was 80, which represented about 80.0% response rate. Since the response rate is quite high compared to a previous study, it shows that respondents are interested in this research. Next, after the distributed questionnaires have been collected, data is analysed. Finally, the interpreted result is combined and reported.

## 3. Result

Descriptive analysis is a technique which is used in describing the extent of LP [27]. The data is computed into means and standard deviation. Mean value obtained provides the average of respondents answered based on questionnaire [28][29]. While standard deviation is used to measure the dispersion of the data in which how close the entire set of data is to the average value. The lower the value of standard deviation, the closer is the data to the average value. Table 1 shows the level of mean measurement which is ranked by the central tendency level.

**Table 1**: Level of Mean Measurement

| Mean Range | Central Tendency Level |
|---|---|
| High | 5.00-7.00 |
| Moderate | 3.00-4.99 |
| Low | 1.00-3.00 |

**Descriptive analysis: Lean Factors and Business Sustainable Factors**

Table 2 shows the result of descriptive analysis for five factors of Lean practice. Based on the Table 2 has revealed that the average mean score for five average factors of Lean practice has a moderate and High level. 5S shows the highest mean, 6.08.

**Table 2** : Descriptive Analysis: Lean

| Items | Mean | Standard Deviation | Interpretation |
|---|---|---|---|
| Average TPM | 4.4950 | .70007 | Moderate |
| Average JIT | 5.3425 | .85222 | High |
| Average Kanban | 4.3300 | .66759 | Moderate |
| Average VSM | 4.0925 | .48045 | Moderate |
| Average 5S | 6.0825 | 1.16345 | High |
| **Average Mean Score** | **4.8685** | | **Moderate** |

**Comparative study of Lean Practice between Japanese and Malaysian Automotive Service Centre.**

Table 3 shows that hypothesis, H1 is accepted. The result shows that there was a significant difference of lean practices between Japanese and Malaysian automotive service centre with (Z= -3.090, P=<0.01).

**Table 3:** Result of Overall Differences of Lean Practice between Ownerships

| Variable | Mean Rank (Japanese) | Mean Rank (Malaysian) | Z Value | P Value | Result |
|---|---|---|---|---|---|
| Lean Practices | 49.95 | 33.86 | -3.090 | .002 | Sig |

**Critical Factors of Lean Practices between Japanese and Malaysian Automotive Service Centre.**

Based on the Table 4 reveals that the results of Mann Whitney U test for all critical factors of lean practices based on ownership for automotive service centres have significance result with (P<0.05) except Value-Stream-Mapping (VSM), which is not significance, P > 0.05. Table 4 shows that TPM has significant differences between Japanese and Malaysian automotive service centres (Z= -2.942, P=<.01) with Japanese mean rank (MR=49.35) higher than Malaysian mean rank (MR=34.29). Besides, JIT has significant differences in Japanese and Malaysian automotive service centres (Z= -2.963, P=<.01) with Japanese mean rank (MR=49.15) higher than Malaysian mean rank (MR=34.43). In addition, Kanban has significant difference (Z= -2.777, P=<.01) with Japanese mean rank (MR=46.42) higher than Malaysian mean rank (M=32.17). However, VSM has not significant difference between Japanese and Malaysian automotive service centres (Z= -.930, P=.352>.05) with Japanese mean rank (MR=42.05) lower than Malaysian mean rank (M=38.22). 5S has significant difference between Japanese and Malaysian automotive service centres (Z= -5.166, P=.000<.05) with Japanese mean rank (M=55.11) higher than Malaysian mean rank (M=30.24).

**Table 4:** Result of Critical Factors of Lean Practices between the Ownerships

| Hypotheses | Critical Factors | Mean Rank (Japanese) | Mean Rank (Malaysian) | Z value | P value | Result |
|---|---|---|---|---|---|---|
| **H1a** | **TPM** | 49.35 | 34.29 | -2.942 | .003 | Sig |
| **H1b** | **JIT** | 49.15 | 34.43 | -2.963 | .003 | Sig |
| **H1c** | **Kanban** | 46.42 | 32.17 | -2.777 | .005 | Sig |
| H1d | VSM | 42.05 | 38.22 | -.930 | .352 | Not Sig |
| **H1e** | **5 S** | 55.11 | 30.24 | -5.166 | .000 | Sig |

## 4. Discussion

The result shows there were significant difference of LP between Japanese and Malaysian automotive service centres (Z=-3.09, P<0.05). It is proved that Japanese companies has higher lean practices compared to Malaysian automotive service centre [30]. It is aligned with Nordin et al., [31], the study showed that LP implementation in Malaysia automotive industries are not comprehensive compared to Japanese companies. Based on the analysis, the result of Mann Whitney U test shows that four out of five critical factors of LP between ownerships have significance result with (P<0.05). In addition, TPM, JIT, Kanban, VSM and 5S were higher practices in Japanese companies against Malaysian companies. However, VSM has not significant difference between ownerships. According to Esfandyari et al., [32], VSM is considered as an approach that is able to observe all the stages in the production process such as production flow from raw material to the end consumer. In service sector, many companies have used VSM to improve process such as from preparation to contribute service to the customer. Hence, VSM is considered a common tool amongst Japanese and Malaysian automotive service centres. Many Malaysian companies in Malaysia are still in the journey of LP implementation and they need recommendation guidance to compete with other long-term established companies. Base on the survey result, the significant differences are identified as weak points of Malaysian companies as an opportunity to improve. Based on the survey results, the significant differences are identified as weak points of Malaysia companies as an opportunity to improve. In order to reduce this gap further the following recommendations are made:

- **TPM**: TPM schedule must be established and followed by TPM group and machine operators. Machine operators must be trained daily basic maintenance for their equipment. TPM group must also implement FMEA to forecast problem might be happened and do pro-active TPM.
- **JIT**: All parts which necessary by service centre must be based on JIT. It will reduce cost and storage area.
- **Kanban**: Kanban displays all information which required parts by service centre and eliminate space area.
- **5S**: Organise work place will improve productivity and image of service centre.

## 4. Conclusion

The finding of this research shows that there was significant differences of lean practices between Japanese and non-Japanese automotive service centres.

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