A Conceptual Model for Full-Blown Implementation of Lean Manufacturing System in Malaysian Automotive Industry

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Abstract

Lean manufacturing strategy is a well-known manufacturing approach that is acknowledged to be capable and effective towards achieving higher performance standards by limiting waste, improving manufacturing processes through continuous improvements and employee involvement and experiencing sustainable growth by creating synergistic value streams across a manufacturing environment. Implementations of lean manufacturing system within the automotive industry in Malaysia is not as far-reaching as expected and is currently being adopted as a pick-and-choose system and only being applied in certain stages and known areas. This approach does not allow these organizations to fully explore and exploit the system’s effectiveness; neither do they experience any massive improvements when measured against lean manufacturing success standards. However, factors affecting the lean manufacturing implementation in Malaysia is still seldom debated or being discussed in literature reviews. In this paper, the current level of these implementations of Lean Manufacturing System (LMS) in Malaysia is discussed. The obstacles of implementation also are highlighted. The aim of this paper is to propose a conceptual model for a full-blown implementation of LMS for the manufacturing industry in Malaysia, specifically for the automotive parts manufacturing industry. This model is expected to contribute, as a comprehensive guideline for any LMS implementation within an organization.

Keywords
Lean manufacturing system, Malaysian automotive industry, productivity improvement, product quality, implementation barriers.

1. Introduction

Automotive industry in Malaysia currently faces a variable number of challenges in order to be classified as a world class manufacturing producer, as well as being sustainable in the globally competitive automobile manufacturing business. The current focus is mainly through competition with others via competitive pricing, including the fast time-to-market of products. However, by only focusing on a pricing strategy while having a looser stance on quality could have its drawbacks.

As global customers are becoming highly educated and more open to new ideas and types of information, the preference has shifted to ingenious design forms, high quality materials used and build-up designs, technological advancements related to Research and Development (R&D), branding and image building, as well as country of production. In line with this thinking, it is prevalent for manufacturing entities to address these needs accordingly, whilst striving for quality yet still making their products attractive and affordable.

In order to sustain in this competitive scenario, many manufacturing companies have started-off adopting or wanting to change their current manufacturing system to a superior, more productive strategy that can increase efficiency, improve their performance and thus competitiveness. Lean manufacturing strategy was implemented by many companies especially in Japan and elsewhere in the world, and had achieved tremendous growth and improvements. The ultimate goal of lean manufacturing is to create a smooth and high-quality organization that is able to produce
finished products concerning to the customer’s demand in the quality-looked with no waste, with competitive pricing.

Lean Manufacturing strategy is being supported by the Malaysian government, towards creating a world class manufacturing industry, and one that could be sustainable against high competition levels within the global automotive market. The implementation of LMS is considered to be very useful in the automotive industry in Malaysia, in order for the industry to improve their operational performances as well as to remain competitive (Noor Azlina Mohd Salleh et al. 2011). However, the implementation of LMS in Malaysia specifically in the automotive industry can be categorized as in a 'beginning stage'. There are few studies focusing on the implementation strategy of this system, which includes a study on the barriers of implementing the LMS system. Without a proper structure in the implementation strategies and its adoption, the advantages of the system could not be gained by the Malaysian automotive industry. In this regard, a total-systems approach ensures that sustainability and the ultimate goals of the lean manufacturing system could be achieved. To the best of our knowledge, there are no clear guidelines or step-by-step procedure in effectively implementing a full-blown application of lean manufacturing system (Noor Azlina Mohd Salleh et al. 2011, Bhasin and Burcher 2006, Abdullah et al. 2006 and Shah and Ward 2007). In order to solve these problems and to ensure firms having a successful implementation, a set of implementation guidelines is needed to be formed as a basis for guidance, comparison of performances over time and strategic setting factors for those desiring to implement and adhere to the LMS philosophy.

Thus, in the next section, the previous studies pertaining to the LMS implementation in Malaysia and the implementation barriers is discussed and the conceptual model of a full-blown implementation of LMS is proposed.

2. Current Implementation of Lean Manufacturing System in Malaysia

In this age of business, research that are based on LMS in Malaysia are becoming popular and are expanding at a high rate. Multiple ways and techniques have been introduced upon LMS implementations in Malaysia and in the automotive industry. These genuine effort, is to ensure having LMS success in Malaysia and the implementations carried out should be sustainable. Summarizations of the relevant studies in the implementations of LMS in Malaysia is described in Table 1.

<table>
<thead>
<tr>
<th>Author(s) and Year</th>
<th>Objectives</th>
<th>Methodology</th>
<th>Results/Findings</th>
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<tbody>
<tr>
<td>Wong et al. (2009)</td>
<td>•Investigate the level of adoption of LMS in Malaysian electrical and electronics industry. •Examine the tools and techniques used and obstacles in implementation.</td>
<td>Survey Based study - total of 350 questionnaires were distributed (12.6 % respondent rate (rp)). Questionnaire based on 14 key areas identified from literature review.</td>
<td>•The level of LMS implementation = between moderate to extensive. •14 key areas were implemented.</td>
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<tr>
<td>Norani Nordin et al. (2010)</td>
<td>•Investigate the LMS implementation in Malaysian automotive industry. •Determine the impact of organizational change to successful lean implementation.</td>
<td>A survey based study - total of 150 questionnaires was distributed (40% rp). Questionnaire is adapted and modified from the literature review to suit the objectives of study.</td>
<td>•Organizational change has a positive relationship with lean implementation. •The 11 factors (except 1 only) of organizational change have a significant impact towards the LMS implementation level in the organization. •Company under “lean” category implemented most of the factors compared to “non-lean” and “in-transition” category.</td>
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</table>
Based on the literature review, the initial study pertaining to the LMS implementation in Malaysia was reported in 2009 (Wong et al. 2009). The study was conducted in the Malaysian electrical and electronics industry. In the study, 14 key areas were used as a useful guideline for the organization in implementing the LMS (Customers, Management and Culture, Safety and Ergonomics, Material Handling, Employees, Works Processes, Inventory, Tools and Techniques, Equipment, Layout, Scheduling, Quality, Suppliers and Product Design). This study also claimed that the LMS has been widely implemented in the electrical and electronics industry. Interestingly, the result showed that on average, organizational implementation levels was rated as “moderate-to-extensive”. Overall, the study suggested that by implementing the 14 key areas in LMS, the results were more successful as compared to having a single key area or tool implementation. Due to this, this study has become one of the most important research studies that are referenced with regards to the LMS implementation in Malaysia, and subjected to parallels against the automotive industry.

Other related studies pertaining to the implementation of LMS in the Malaysian automotive industry were also done by Norani Nordin et al. (2010), Baba Md Deros et al. (2010), Rasli Muslimen et al. (2011) and Meysam et al. (2012). Norani Nordin et al. (2010) successfully identified 11 factors of organizational change that had a positive relationship with LMS implementation in an organization. The study summarized that companies under the “lean” category implemented most of the factors as compared to ‘non-lean’ and the ‘in-transition’ category.

One study undertaken by Rasli Muslimen et al. (2011) had identified that strategy development and formation of a LMS implementation, as crucial aspects for an automotive parts manufacturing organization. To implement the LMS, this company had formed a team to perform their mission, then identifying the needed improvements; they identified the waste reduction as a major activity. Project-based strategy was then used, coupled with the full support and a clear direction from the top management, in order to have some indication of success. Unfortunately, the study did not describe in detail activities that were eventually applied in that company. Overall, this case study suggested
that this company's strategy setting experience can be a benchmark for others that want to start their journey towards implementing the LMS.

The study done by Meysam et al. (2012) had identified the general practices in implementation of LMS within the automotive and heavy industries. Both industries were selected and the results obtained were compared. The framework for LMS implementation in Malaysian heavy industry and automotive industry were then developed based on the used of 13 activities of JIT practices. The automotive industry gained more benefit from LMS implementation through multiple activities during the implementation stage.

A case study conducted by Baba Md Deros et al. (2010) pertaining to LMS implementation in Malaysia, explains the approaches and barriers that existed during a LMS implementation in 3 companies that they had looked at. The companies were chosen from different types of industries. Basically, the study showed that every company had set their own framework based on their industry background, needs and goals. The companies had also given great attention to equip the worker with the understanding and knowledge through training and realized that training is an important element for implementing LMS. All of these companies gained high commitment from top management for these changes to take place. However, the implementations of Lean tools were limited and only utilized a “pick and choose” concept based on the suitability of their production processes and product-line set up. Generally, the study provided some basis on the level of LMS implementation in Malaysia, especially within the automotive industry, but not on a company-wide approach or as a total encompassing concept adoption.

In general, completed research on LMS implementations, mostly mentions the need to have a total approach towards LMS, and not by applying only one factor or only a single activity, or as only a pick-and-choose system to achieve any beneficial gains (Wong et al. 2009, Norani Nordin et al. 2010, Baba Md Deros et al. 2010, Rasli Muslimen et al. 2011, Meysam Salimi et al. 2012). In fact, in Malaysia, a full blown implementation strategy has yet to be studied, with most organizations were found to have tried implementing lean manufacturing their own way without any proper guideline on how to implement the LMS properly and also effectively. It is also found, the study on performances and the effects of LMS implementations are very limited. Mainly done on a general basis of the industry, without going deep into the specifics of LMS. This is due to the LMS being in its infancy and needs time to have any bearing on their measured performance (Bhasin and Burcher 2006, Pius et al. 2006, Andrew 2006, Jannis et al 2010, Jostein 2009, Papadopoulou and A-zbayrak 2005, Shah and Ward 2003). Moreover, studies pertaining to the barriers of LMS implementation in Malaysia have also been undertaken. These identified barriers are also discussed in this paper.

3. Barriers in Implementation of Lean Manufacturing System in Malaysia

The barriers of LMS implementation in Malaysia, especially in the automotive industry are none the less significant, few studies have been conducted in order to identify the obstacles that hinders the LMS implementation in Malaysia (Wong et al. 2009, Baba Md Deros et al. 2010, Norani Nordin et al. 2011, Anvari et al. 2011). According to Norani Nordin et al. (2011), the major challenge in implementing LMS in Malaysian automotive industry was in understanding the real essence of LM concept and its philosophy. In their studies, they have identified the “lack of lean understanding” as the main barrier to be faced by 3 types of organization (non-lean firms, in-transition firms and lean firms). This was because LMS required new knowledge understanding and cultural change adaptations during the implementation process. Besides, in order to have a successful LMS implementation in an organization or a company, LMS should be applied comprehensively and holistically in its principles and concepts (Shah and Ward 2003 and Norani Nordin et al. 2011).

The study done by Wong et al., (2009) also investigated the obstacles of LMS implementation within the electrical and electronics industry in Malaysia. The major obstacle identified was “backsliding to the old ways of working”, due to employee resistance in implementing LMS and a resistance to change or unwilling to follow new methods introduced from an LMS implementation.

On a study completed by Baba Md Deros et al. (2010) on the other hand showed that resistance from the middle management was another main obstacle in a LMS implementation. This was based on an earlier research made by the Lean Enterprise Institute (Lean Enterprise Institute 2005), their studies highlighted, this middle resistance occurred due to the lack of knowledge and understanding of LMS' main principles.
In general, the lack of knowledge or understanding of LMS concept (philosophy) is regarded as an obstacle in LMS implementations in Malaysia. Therefore, in efforts to implement this invaluable but revolutionary system within an organization, the knowledge pertaining to LMS has to be provided to the entire workforce, in order to create the fundamental knowledge base or understanding about LMS, thus creating an easier path in its implementation throughout the organization. Table 2 shows the summary of the identified barriers from the previous studies.

Table 2: Summary of the obstacles of lean manufacturing system implementation in Malaysia

<table>
<thead>
<tr>
<th>The Obstacles of Lean Manufacturing Implementation in Malaysia</th>
<th>Attitude of shop floor employees and middle management</th>
<th>Inability to quantify benefits</th>
<th>Lack of top management /senior management commitment</th>
</tr>
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<tbody>
<tr>
<td>Backsliding to the old ways of working</td>
<td>Lack of implementation know-how</td>
<td>Lack of understanding of LMS concepts</td>
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<tr>
<td>Budget constraints</td>
<td>Lack of communication</td>
<td>National culture</td>
<td></td>
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<tr>
<td>Company culture</td>
<td>Investment cost</td>
<td>Nature of manufacturing facility</td>
<td></td>
</tr>
<tr>
<td>Failure of past lean projects</td>
<td>Lack of time to implement</td>
<td>View as “flavor of the month”</td>
<td></td>
</tr>
<tr>
<td>Does not practice what is preached</td>
<td>Lack of know-how to implement</td>
<td>Resistance from middle management, supervisors and employees</td>
<td></td>
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</table>

4. A Conceptual Model of Lean Manufacturing System in Malaysia

Based on the review of multiple literatures that are available, several gaps were identified in the field of Lean; its influencing factors versus its application or implementation, its performance measurement - in engineering, financial and also other dimensions and the lack of the development of a structured framework available for LMS implementations. Thus, a conceptual model for the study of the full-blown implementation of LMS in Malaysian automotive industry is proposed. Further study on identifying the relevant influencing factors and LMS dimensions via development of hypothesis testing will be needed in achieving the aims of the study. Figure 1 shows the conceptual model of full-blown implementation of LMS in the automotive industry.

Figure 1: Conceptual model of the full-blown lean manufacturing system implementation
5. Conclusion

Overall, based on the previous studies consolidated and presented in above, it is feasible to derive elements that need to be looked into and scrutinized further in order to tackle the idea of having successful LMS implementation in Malaysia. These known factors are not only present in the Malaysian automotive industry but has also been cited by numerous foreign research, so it is highly imperative to have studies conducted on the LMS within the Malaysian context. Thus, understanding of these issues directs researchers to investigate further the relevant issues pertaining to LMS implementation in Malaysia, its difficulties, perceived barriers, work culture, monetary restraints, knowledge base and its understanding. The study should also focus on the philosophical approach behind lean, which is harder to define and understand, as compared to more measureable performance indicators brought about by LMS approach improvements. The proposed conceptual model will be the initial start-off point and is expected to contribute as a comprehensive guideline for LMS implementation efforts within an organization, specifically for the Malaysian automotive industry.

Acknowledgements

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Biography

Eida Nadirah Roslin is currently a PhD Candidate in the Department of Mechanical Engineering at Faculty of Engineering, University of Malaya. She obtained her Bach. Engineering from International Islamic University Malaysia and Master of Engineering in Manufacturing System from Universiti Putra Malaysia. She was an Engineer at Production Engineering Department, PROTON Berhad and a Project Engineer at TNB Engineering Corporation Sdn Bhd. Her research interests include manufacturing system, operation management and Lean.

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