THE RELATIONSHIP BETWEEN SUSTAINING LEAN IMPROVEMENTS AND SUSTAINABLE PERFORMANCE FOR AUTOMOTIVE INDUSTRY IN MALAYSIA

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ABSTRACT

This paper shows a relationship between sustaining lean improvements and sustainable performance is at the roots of environmental sustainability, economic sustainability and corporate social responsibility (CSR) sustainability via proposed model to carry out an empirical research in Malaysian automotive industry. For this decade, automotive manufacturing companies are dealing with the sustainability problems in input materials, manufacturing processes, and waste disposal, among others. Hence, this paper attempts to gain a picture of the current theme of emphasis on sustaining lean improvements indicators among the automotive manufacturing companies in Malaysia and also on sustainable performance. In brief, more extensive research and collaboration is needed to increase understanding of sustaining lean improvements in manufacturing area and applications of sustainable.

KEYWORDS: Lean Manufacturing; Sustainable Performance; Continuous Improvement; Automotive Industry

INTRODUCTION

Malaysia which is located in the centre of ASEAN region with a population of more than 28 million people offers vast opportunities for global automotive and component manufacturers to set up manufacturing and distribution operations in this country. External environment of business namely: (i) economic stability; (ii) culture of the country; (iii) research and development of technology; (iv) political and law stability; and (v) global participation have attracted major international automotive and component manufacturers to invest in Malaysia. Currently, according to Malaysia’s Automotive Industry (MAI, 2010), there are 28 manufacturing and assembly plants producing passenger and commercial vehicles, composite body sports cars as well as motorcycles and scooters. These plants have a total installed capacity of approximately 963,300 passenger and commercial vehicles and about 1 million motorcycles per year, with production catering primarily for the domestic market. Moving forward into 2012, Malaysia Automotive Institute (2012) foresees a brighter automotive sales and production despite the uncertain economic environment. While sales in the US are set to continue a steady recovery in 2012,
the emerging countries such as China and India are expected to continue outperforming the developed countries. Elsewhere within the ASEAN countries, Thailand and Indonesia are also expected to continue their strong growth this year in line with the GDP forecasted by respective countries, while Malaysia forecasts at least a 5.1% growth in 2012. As such, the total industry volume (TIV) is also likely to flourish in 2012 due to high correlation between gross domestic product (GDP) and TIV.

The concepts of sustaining lean improvements (SLI) have been studied in particular by Schlichting (2009) and Murti (2009). Schlichting (2009) focus on investigate the root causes that lead to a time dependent loss of lean improvements among manufacturing organizations from three different perspectives such as standard work, employee involvement and continuous improvement. In addition, in for create standards, one should implement standard work all across the shop floor and in addition use standard improvement to ensure that further development will not distort the standards. In order to achieve employee involvement, the finding suggested visual management tools to empower every employee by making information available as well as kaizen events to teach employees about lean and train their problem solving skills (Schlichting (2009). In conjunction with job rotation, which enables the employees to cooperate on problem solutions, these tools ensure thorough employee involvement which will increase the buy-in into the lean improvement ideas and thereby make them more sustainable. At last, continuous improvement supports the sustainability of lean implementations by constantly challenging the current state process, thereby not allowing for a loss of focus on the already implemented changes.

Meanwhile, Murti (2009) has seeks to study the lean journeys of nine New Zealand companies to establish key inhibitors and enablers to sustaining lean manufacturing sector in New Zealand. The companies were assessed for lean sustainability using a recognized sustainability model. The findings showed that many companies experienced good initial gains from implementation lean but the majority failed to sustain these improvements. These problem were; erroneous understanding of lean, poor change strategy, poor senior management team commitment, New Zealand Trade and Enterprise funding pushing change, high staff turnover, high staff resistance and failure to develop the lean champion’s capabilities. As a conclusion, lean improvements were not sustained across New Zealand manufacturing companies except one case study company looked likely to sustain improvements.

In Malaysian automotive industry, the concept of SLI has change and becoming more stable in our country and industries. As a good example is, Malaysia has made significant progress, with Proton unveiling its first locally-designed model in 2000 and developing its own engine in 2002. The new Proton plant in Tanjung Malim, Perak is highly automated, employing robotic technology, and is designed for high volume production and efficiency, using lean manufacturing processes. Therefore, the complexities involved in the above-mentioned focus areas for SLI, optimized solution, and corresponding underlying models, are necessary. Thus, this paper presents a review of current trends for achieving sustainability at the lean practices and performance, with a focus on modeling and optimization aspect.
SUSTAINING LEAN IMPROVEMENTS (SLI)

For more than 40 years, lean manufacturing techniques have been achieving outstanding success rates. First in Japanese plants, and now in advanced factories throughout North America, it has proven to be a cost effective and flexible approach to achieving superior customer satisfaction (Kivell, 2012). Hence, this paper’s proposed that SLI depends on three aspects such as standards work (Murphy, 2001; Foschi, 2009; Graban, 2009), employee involvement (Cabrera et al., 2003; Jones and Kato, 2005) and continuous improvement (Pay, 2008; Terziovski and Sohal, 2000; Schlichting, 2009) which have adopted the conceptual proposed by Schlichting (2009). However, some amendments constructs have been made based on this paper’s proposed.

Standards work is the current one best way to safety completes an activity with the proper outcome and the highest quality (Graban, 2009). Taiichi Ohno is often quoted as declaring that improvement will be occurring while applying a standard work. Tim Whitmore, Vice President of Consulting Services at Simpler Consulting, elaborates on this quote by saying that the principles of lean do not work well when everyone is allowed to choose their own work method or work sequence in which to do a job: the outcome is unpredictable; flow and pull are impossible (Schlichting, 2009 cited in Whitmore, 2008). Many researchers have done their study in this area. For instance, a study by Murphy (2001) makes a research in incentives which has focused on performance measures and pay-performance sensitivities but has largely ignored the performance standard, which generates important incentives whenever plan participants can influence the standard-setting process. According to Murphy (2001), internally determine standards are directly affected by management actions in the current or prior year, while externally determine standards are less easily affected. The finding showed that companies using budget based and other internally determined performance standards have less-variable bonus payouts and are more likely to smooth earnings, than companies using externally determined standards.

With reference to previous studies related to employee involvement definition, Apostolou (2000) concluded that employee involvement is regarded as a unique human being, not just a part in a machine and each employee is involved in helping the organization meet its goals. Each employee’s input is solicited and valued by management. Currently most researchers agree that employee involvement is one of the major causes of the increase in running the business. This is clearly supported by Cabrera et al. (2003) results, which showed a highly significant positive relationship between competition and employee involvements. Besides that, it may also be due to the fact that employees that are in direct contact with the customer are more aware of their needs and, therefore, have valuable information regarding how to better serve the client. Thus, organizations will be able to improve their customer service, if the employees are involved in the decision making process. This is also coincides with another author like Jones and Kato (2005). This is because, Jones and Kato (2005) presented an econometric case study for employee involvement on manufacturing firm performance. One of the findings showed that employee involvement will produce improved enterprise performance through diverse channels such as: (i) membership in offline teams initially enhances individual productivity by about 3% and rejection rates by about 27%; (ii) these improvements are dissipated, typically at a rate of
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10 to 16% per 100 days in team; (iii) the introduction of teams is initially accompanied by increased rates of downtime and these costs diminish over time. In addition: (iv) the performance-enhancing effects of team membership are generally greater and more long-lasting for team members who are solicited by management to join teams whereas the cost of team membership (increased downtime) is smaller and diminishes more rapidly as team members engage in learning by doing for such solicited members; similar relationships exist for more educated team members.

Furthermore, continuous improvement, also known as kaizen event, is arguably the most critical of SLI. The concept behind continuous improvement is that changes are made and continually improved upon. Although perfection will never be achieved, the goal is to continue reaching for it through small improvements. Evidence showed that numerous organizations that have deployed continuous improvement initiatives have not been successful in getting what they set out to achieve. Results of a 2007 survey of US manufacturers showed that while 70% of plants had deployed lean manufacturing techniques, 74% of these were disappointed with the progress they were making with lean (Pay, 2008). However, the advantages of continuous improvement have been found in previous literatures. The data analysis from Terziovski and Sohal (2000) revealed that the motivation to adopt continuous improvement is relate to improve quality conformance, increase productivity, to reduce costs and improvement in delivery reliability. Schlichting (2009) has also identified the advantages of continuous improvement namely: (i) reduce the cost; (ii) move towards the goal of regaining profitability; (iii) reducing transportation; (iv) eliminate the waste of waiting; and (v) decrease the utilization.

In conclusion, based on the current findings above, standard work, employee involvement and continuous improvement are a foundational element of SLI methodologies. Without these, the gains made from organizing work cells, creating flow production, and starting continuous improvement teams will only be temporary.

SUSTAINABLE PERFORMANCE (SP)

Existing performance measurement is used to improve organizational performance. Performance measurement can help an organization measure progress towards its goals, understand its current situation, address the key issues, and the options available (Searcy et al., 2008). This statement is also supported by Amaratunga et al. (2000) who proved that performance measurement as the process of quantifying the efficiency and effectiveness of an action. Effective performance measurement can let us know about a way of doing something, achieve the goals, customers’ satisfaction, work under control, and improvements are necessary (Isik, 2009). Therefore, performance measurement is the process to identify how successful organizations or individuals have been in attaining their objectives and strategies.

According to previous authors (Mayyas et al., 2012; Moldan et al., 2012; Schoenherr, 2011; Bartelmus, 2010; Singh et al., 2009; Labuschagne et al. 2005; Veleva and Ellenbecker, 2001), sustainable developments could improve three dimensions of SP namely: (i) environmental sustainability; (ii) economic sustainability; and (iii) corporate social responsibility (CSR) sustainability.
Environmental sustainability refers to the use of energy and other resources and the footprint companies leave behind as a result of their operations. It is often related to waste reduction, pollution reduction, energy efficiency, emissions reduction, decrease in the consumption of hazardous materials, and decrease in the frequency of environmental accidents. Social sustainability shifts the focus to both internal communities and external ones (Pullman et al., 2009). Indeed, firms engage in CSR activities as a way to enhance their social reputation (Fombrun, 2005). Whereas, economic sustainability is the criteria by how a pound of profit is made is a building block in the creation of a just capitalism; progressive profitability must replace simple financial profitability as the sole yardstick of business success (Doane and MacGilivray, 2001 cited in Hutton, 2001). Based on the current literature, there have been various dimensions of the sustainable performance that were used by previous studies. A summary of SP measurements is given in Table 1.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Literature/Authors</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Sustainability</td>
<td>Yang et al. (2011)</td>
<td>1. Improved environmental performance; and 2. Reduced the negative impact of environmental management practices on market and financial performance.</td>
</tr>
<tr>
<td></td>
<td>Schoenherr (2011)</td>
<td>1. Provide further motivation for firms to implement environmental initiatives; 2. Increase the customers’ perception of the plant’s product in the marketplace; 3. Increase the quality performance; and 4. Increase a plant’s competitive advantage.</td>
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<tr>
<td></td>
<td>Hermann et al. (2007)</td>
<td>1. Complete in that it includes parts of the production chain that are outside the boundaries of the industrial system itself; 2. Making the results easy to interpret for policy purposes; and 3. Uses readily available information.</td>
</tr>
<tr>
<td>Economic Sustainability</td>
<td>Rennings et al. (2006)</td>
<td>1. Increase in the number of employees; 2. Increase in turnover; and 3. Increase in exports.</td>
</tr>
<tr>
<td></td>
<td>Kumar and Sutherland (2009)</td>
<td>1. Decrease the price paid to the last user; 2. Increase the selling price; 3. Increase the overhead cost; and 4. Increase levels of dismantling.</td>
</tr>
<tr>
<td>CSR Sustainability</td>
<td>Hutchins and Sutherland (2008)</td>
<td>1. Positive impact of social change; 2. Establish a comprehensive social footprint;</td>
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METHODOLOGY

This research is going to use quantitative survey in the Malaysian automotive industry. The main reason why this research chose the Malaysian automotive industry is because the performance of the national car and the supplied parts by local suppliers still receive criticism, complaints and various suggested approaches to improve their product quality, operation management, and customer satisfaction (Habidin, 2012). Population of this research comprised on automotive industry in Malaysia. Questionnaires will distribute to respondents from the listing of automotive industry obtained from Malaysian Automotive Component Parts Association (MACPMA), Proton Vendors Association (PVA) and Kelab Vendor PERODUA.

To determine the causal relationship between the different constructs of the suggested model of the research, Structural Equation Modeling (SEM) technique was adopted. Ullman (2001) has been described that SEM as a combination of exploratory factor analysis and multiple regression. A review of current trends in SEM methodology research according to Wothke (2010) are (i) statistical models and methodologies for missing data; (ii) combinations of latent trait and latent class approaches; (iii) Bayesian Models to deal with small sample size; (iv) non-linear measurement and structural models; and (v) extensions for non-random sampling, such as multi-level models. Thus, SEM technique is one of the most techniques that one can use to reduce the number of observed variables into a smaller number of latent variables by examining the co-variation among the observed variables Schreiber et al. (2010). Due to the increased emphasis on SEM technique that perform the require statistical analysis of the data from the survey, this paper employed the SEM technique to investigate the relationship between SLI and SP as...
shown in Figure 1. Meanwhile, Statistical Package for the Social Sciences (SPSS) version 17 was used to analyze the preliminary data and provide descriptive analyses about thesis sample such as means, standard deviations and frequencies. Also, SEM using AMOS 6.0 will be use to test the measurement model.

For this paper proposed, a conceptual model has been used to present the relationship between SLI and SP as presented in Figure 1. This proposed model has adopted the conceptual proposed by Zubir (2012) cited in Millar and Russell (2011) and Fairfield et al. (2011). However, some amendments especially on SLI implementation and SP constructs have been made.

![Proposed Conceptual Model for SME Framework](image)

*Note: SLI = Sustaining Lean Improvements, SP = Sustainable Performance, SCR = Social Corporate Responsibility

**Figure 1. A Proposed Conceptual Model for SME Framework**

**THE RELATIONSHIP BETWEEN SLI AND SP**

To ensure the relationship between SLI implementation and environmental sustainability performance, research by Jayaram *et al.* (2008) which are studied in the automotive supplier industry find positive relationships between: (i) relationship building and lean design; (ii) relationship building and lean manufacturing; and (iii) lean design and firm performance. This suggests that relationship building is more valuable for enhancing the product aspects of lean strategy as opposed to the process aspects of lean strategy. Process aspects of lean strategy appear to be largely a function of internal efforts. This finding is also supported by Schoenherr (2011). The test of hypothesis revealed ISO 14000 certification, pollution prevention and waste reduction as having a significant and positive effect on quality, delivery, flexibility, and cost performance measures; the initiative of recycling of materials failed to exhibit a significant influence in all four instances. These results, while partially supporting hypothesis, provide intriguing insight, especially also compared to findings in prior research. As such, their study overall supports the notion that environmental initiatives are beneficial, not only in terms of doing the right thing, but also in terms of operational performance Schoenherr (2011) cite in Montabon *et al.*, (2007).
From the aspect of economic sustainability, Hofer et al. (2012) explored the relationship between lean production implementation and financial performance. Based on an analysis, the effect of lean production on financial performance is found to be partially mediated by inventory leanness. In addition, there is strong evidence that the concurrent implementation of internally-focused and externally-focused lean practices yields greater performance benefits than selective lean production implementation. The studies’ findings are largely consistent with Yang et al. (2011). This study explores relationships between lean manufacturing practices, environmental management and business performance. The findings suggest that prior lean manufacturing experiences are positively related to environmental management practice. Therefore, the paper provides empirical evidences with large sample size that environmental management practices become an important mediating variable to resolve the conflicts between lean manufacturing and environmental performance. Additional contextual analyses suggest that differences exist in terms of the strengths and statistical significance of some of the proposed relationships. Meanwhile, Demeter and Matyusz (2011) who have concentrate on how companies can improve their inventory turnover performance through the use of lean practices. According to their main proposition, firms that widely apply lean practices have higher inventory turnover than those that do not rely on lean manufacturing.

Evidence of positive effects of lean improvements on CSR sustainability performance is presented by Groen et al. (2012) have showed the performance can improve via: (i) attitude, in consequence of feedback in improvement initiatives; (ii) social pressure, because it provided the maintenance technicians with shared priorities and targets; and (iii) capability, because the performance measures uncovered various improvement opportunities. These variables in turn positively influenced employee initiative. Questionnaire results show that attitude, social pressure, and capability are significantly correlated with employee initiative. Another study by Brammer et al. (2005) found that the importance of gender variation and suggest both that external CSR is positively related to organizational commitment and that the contribution of CSR to organizational commitment is at least as great as job satisfaction.

However, the relationship between SLI and SP in Malaysian automotive industry will be investigated deeply via this paper propose. A hypothesis regarding the relationship between SLI and SP is formulated as follow: H1- There is a positive and direct significant relationship between SLI implementation and SP in Malaysian automotive industry.

CONCLUSIONS

The aim of this paper was to carry out the theoretical study on the determinants of critical success factors (CSF) of SLI namely (i) standard work, (ii), and SP in the Malaysian automotive industry. The main contribution of this paper was to persuade practitioner from the listing of automotive industry to take an attention on the relationship among CSFs of SLI and SP in Malaysian automotive industry.

Due to lack of studies on above addressed problem in the country, attempts were made to investigate the CSFs of SLI in Malaysian automotive industry. This study theoretically reviewed prior literatures on same problem in our country. The aim was to shed some light on the research problem. In future agenda,
a survey is designed in order to conduct an empirical research for examining survey’s hypotheses. It is hoped that the important facts addressed in this paper will be a means whereby managers and researchers will be able to investigate the SLI problem in Malaysian automotive industry with better awareness.

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