

Green Lean Six Sigma and Financial Performance in Malaysian Automotive Industry

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Abstract

Nowadays, the pressure of competition from multi-national companies had increased and among them is the automotive industry. It is the impact when the level of competition is intensifying as the manufactured vehicles shifts from being national to global. As a part of the competition, the important of understanding the implementation of green concepts is really useful for Malaysia to be a good competitor in Asian. Green concepts could provide assistance in making decisions at the early stage of the vehicle design and development process in order to avoid the costs and time consumed through later redesign. Thus, this study aims to build an effective model which indicates the relationship between Green Lean Six Sigma (GLSS) and Financial Performance (FP) in Malaysian automotive industry. The conceptual model using Structural Equation Modeling (SEM) has been proposed. Based on the proposed conceptual model and reviewed, research hypotheses are being developed. This research concludes with suggest future research work.

Keywords: Green lean six sigma, Financial performance, Environmental, Automotive, Structural equation model

1. Introduction

Recently, most develop countries planned to force automotive industry to recover and recycle their product. This condition occurs due to the level of production has become unprofitable in the face of increasingly segmented niche market. Therefore, automotive industry should take some method to prevent those huge issues and challenges parallel with their goal to improve volume of financial performance. One of the methods is exploring the concept of Green Lean Six Sigma and identify whether this method will affect the performance of the automotive industry in Malaysia.

Many companies think corporate environmental management will hinder their growth and development and has been deemed an unnecessary investment (Chen *et al.*, 2006). However, some previous studies have contradicted this statement by giving evidence that companies engaging in environmental management and green innovation actively can improve the productivity as a whole such as increase corporate reputation, and thereby enhance corporate competitiveness under the trends of popular environmentalism consciousness of consumers and severe international regulations of environmental protection instead of not only minimize production waste and increase productivity (Chen *et al.*, 2006).

Roughly, Lean Six Sigma (LSS) is described fusion concept where a company has adopted the simultaneous removal of waste by reducing a defect in the products to ensure that they are quality. Generally, Lean six sigma (LSS) known particularly as a cost reduction mechanism. It can be defined as a new organizational change and improvement method, (Hoerl *et al.*, 2004; Edward and John, 2005). When companies have to operate in a highly competitive globalize market, LSS techniques may help companies to improve operational efficiency and effectiveness. (George *et al.*, 2003; Hoerl *et al.*, 2004). Therefore, several manufacturer companies have implemented LSS program to improve performance.

Purpose of this paper is to determine and develop research model of the successful implementation of LSS has adopted the concept of 'green' to further enhance competition with other manufacturers and to evaluate its impact on the financial performance for Malaysian automotive industry using empirical study. There have five domain categories in this study that are namely; Leadership Focus (LF), Training and Education (TE), Project Management (PM) and Focus in Metrics (FM).

2. Literature Review

As a growing number of companies work to become more environmentally sustainability, it is become more apparent that such transformation is challenging. Deloitte (2008) was suggesting that LSS can be an effective method in developing a road map for going green. Those combination methods can also help companies increase and environmental performance while they more down the path to sustainability and boost economic.

Using LSS as part of business strategy, it is therefore considered of value to raise awareness of these benefits and disadvantages to the environment coincide with the company's mission to make money as much as possible. Generally, GLSS are the focal elements in the theoretical framework model with leadership focus, training education, project management

and focus in metrics as antecedents and financial performance as consequences. Those factors can help company broaden GLSS so it can be used to improve environmental performance also to ensure positive response towards financial performance of Malaysian automotive industry. Definitions of the elements of GLSS are indicated in Table 1.

Table 1. Definition of Element in Green Lean Six Sigma

ELEMENTS	ELEMENTS Definition
Leadership Focus (LF)	A person with a certain motives, values and access to resources in a context competition and conflict in order to achieve a goal is an accurate reflection of leadership (Burns, 1978). According to Bradshaw (2002), leadership can be defined as position or a process of influencing people which include knowing oneself, other people and how to influence them.
Training and Education (TE)	Positive impact on the performance of an organization can be achieve when the practitioners of Six Sigma do an effective training and education on the CSF for the success and sustainability of a LSS program (Waxer, 2004; Antony and Banuelas, 2002; Pyzdek, 2001).
Project Management (PM)	All project need to be track to ensure that consideration have been submitted, implementation had accepted, all the projects are in progress and completed through project tracking system which it is a good practice (Antony and Banuelas, 2002).
Focus in Metrics (FM)	Companies that effectively use LSS have developed many ways metric slither from the top companies with the aim of coordinating efforts with priority improvement (Deloitte, 2008).

Several researchers have surveyed regarding the concept of LSS but there is only a few of them who relate the concept of 'Green' in their research. In the last few years, the lean and six sigma philosophies have merged to create LSS. Therefore, LSS has a combination set of tools as well as a common approach to lead time reduction, operational cost reduction, and overall quality improvement. There are many definitions related to the green, lean and six sigma by previous authors. Therefore, below is a Table 2, list of definitions and we will discuss how those concept will combine to be one effective concept which can be implement in automotive industry.

Table 2. Definition of Concept

CONCEPT	DEFINITION
Green	• Green design can be defined as the practice that aims to produce a product using minimize of aggregate environmental as possible. Therefore, designer now are being asked to reduce the use of environment impact of products (Li <i>et al.</i>, 2008). • Other than minimize production waste and increase productivity, companies who implement environmental management and green innovation actively can improve the productivity as a whole including corporate reputation which give positive impact through enhance corporate competitiveness under the top trends of environmentalism consciousness of consumers and severe international regulations of environmental protection (Chan <i>et al.</i>, 2006; Berry and Rondinelli, 1998; Porter van der Linde, 1995; Shrivastava, 1995). • Sustainability, waste reduction, and social responsibility can be achieve when the organization use a wide process of applying innovation called green management (Haden <i>et al.</i>, 2009).
Lean	• Getting the right things done, being efficient, and doing them without wasting resources (Peter Drucker, 1967). • Lean production becomes much more common when method in managing operations without massive abutment of inventory. By reduce an inventory, the companies could cut their cost, feedback of quality can be improve, production lead timer are shorten, and the time required to introduce new product or service are reduce (Newman and Hanna, 1996).
Six Sigma	• Six sigma provides specific methods to re-create the process so that defects are significantly reduced or even completely prevented. It shows that Six Sigma may encompass something broader (Beyfogle, 2003). • Elimination of defects in process is parts of Return on Investment (ROI) which can be maximize using Six Sigma known as a methodology that employs statistical and non-statistical tools and technique (Antony, 2005).

Therefore, based on definition above, green, lean and six sigma are discussed regarding on how to minimize waste, cut cost and increase productivity with reducing environment impact. Hence, these the three concepts really need each other. Lean initiatives are being used in production, services, health, construction, maintenance, logistics and distribution, trade and in government with the known goal of reducing turnaround time, operational cost at the same time improving quality. According to George (2010), improve process speed and capacity is the goal of lean concept for eliminating waste and accelerating velocity. However, the organizations fail to sustain their gains or fail to practice the internal habits that drive bottom-line returns and strategic alignment with overarching goals because they apply lean methods only even though they perform with all its potency for streamlined process improvement. From a different view, process variation can have enormous adverse impacts on speed and required capacity. Lean depends on low process variability but lacks an effective analysis approach. Six sigma is well known as a highly effective means uncover and eliminate the root causes of unknown process variability.

Six sigma assist company initiative to eliminate variation and drive priority improvements

across the business. However, if the organization applied six sigma only, benefiting from its fact-based, customer-centric statistical decision-making and root-cause identification, companies often fight to create transformed processes with lower cost solutions. There is no other methods which can explicit approach to remove waste and at the same time improve speed unless it is only relate with defect elimination. According to one-self-reported survey nearly 40% of six sigma practitioners claimed their own project as failed or incomplete (iSixSigma, 2008). Hence, six sigma suffers delayed payback and sub optimized solutions without lean efficiencies and rapid improvement.

2.1 The Relationship Between Green Lean Six Sigma (GLSS) and Financial Performance (FP)

In general, Financial Performance (FP) can be define as how well a firm can use assets from its primary mode of business and generate revenues. This term is also used as a general measure of a firm's overall financial health over a given period of time, and can be used to compare similar firms across the same industry or to compare industries or sectors in aggregation. However, does GLSS or better environmental performance improve a firm's financial performance? In seeking to answer this question, many studies have been conducted.

According to Hart and Ahuja (1996), waste reduction can help in saving costs as the cost of raw material and waste disposal costs lower while it is also able to prevent contamination. It was support by Ghassemi (2002), organizations are looking for something more innovative and cost-effective as a step solution to reduce waste and inefficiency. Right systems and processes in the application of environmental management systems are very important that the opportunity to reduce and eliminate waste and inefficiency would be higher.

However, according to Porter and van de Linde (1995), this paradigm has been challenged by a number of analysts during the last decade. It was argued by Ambec and Lanoie (2008), basically improving a company's environmental performance not necessarily to an increase in cost but it also can lead to better economic or financial performance. In addition, pollution commonly associated with a waste of resources (material and energy) and that environmental policies can stimulate innovation tighter that can offset the cost of compliance with these policies. One of the systematic measures, it is important to look at both sides of balance sheet: increasing revenues and reduce costs to improving the organization's environmental performance guiding to better economic or financial performance and not necessarily to an increase in cost (Porter, 1995).

The rational managers should choose the level of pollution that balances the costs and benefits in whatever the private cost of pollution (McWilliams and Siegel, 2001). According to Hart and Ahuja (1996), a number of scholars have found evidence that financial performance can be improve if they are less-polluting firms. From the past research had indicates that managers exploit other production techniques like lean production and quality management can be influence by differences in search costs (Ocana and Zemel, 1996). While Juran (1998) argues that information about the value of defect reduction is often both delayed and obscured makes managers underestimate the value of TQM. On the other hand, the value

of catching and fixing defects such as allows the firms to meet customer requirements at the end of the line is clear. In this moment, manager could improve process quality and reducing end of line quality control to increase firm's financial performance with one condition, the managers understood the value of such practice.

According to Ambec and Lanoie (2008), there are certain factors need to be concern by the company to increase the financial performance if they implement environmental strategy and it is divided into several parts which are revenue; differencing products; selling pollution; costs of material, energy and service; cost of capital; and costs of labor. Firms have incentives to reduce the environmental damages if financial performance is positively related to environmental performance (Iwata and Okada, 2011). The collection of evidence is very useful to indicate whether the view that pollution abatement may reducing emissions increases efficiency, saves money and at the same time giving firm a cost advantages (Hart and Ahuja, 1996).

3. Research Hypotheses

To better understand the relationship between GLSS practices and FP in Malaysia automotive industry, the following hypotheses will be used and tested. This study proposed that GLSS has a direct impact on the FP and research hypotheses are based on a numbering system from H₁. This style of hypotheses statement is chosen due to the nature of answering hypotheses using Structural Equation Modeling (SEM) methods.

H₂: There is a positive and direct significant relationship between GLSS practices and financial performance in Malaysian automotive industry.

4. Research Methodology

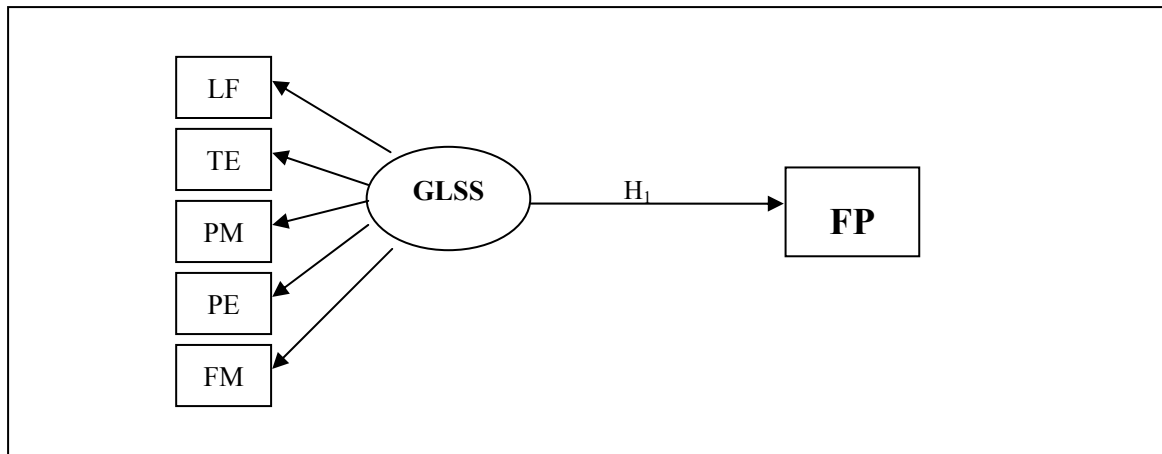
In achieving the objectives of the study, sample methods are by using structured questionnaire. The population of this study comprised in Malaysian Automotive Industry and the data was obtained from Malaysian Automotive Components Parts Association (MACPMA), Proton Vendors Association (PVA) and Kelab Vendor Perodua (KVP).

Using SEM methods, sufficient data is required so that important differences or relationships can be observed, should they exist. SEM techniques was utilize to perform require statistical analysis of the data from the survey. Exploratory factor analysis, reliability analysis and confirmatory factor analysis to test for construct validity, reliability, and measurements loading were performed. Having analyzed the measurement model, the structural model was then tested and confirmed. The 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. Structural Equation Modelling (SEM using AMOS 6.0) will use to test the measurement model.

5. A Proposed Research Model

Based on the literature review, there are not many previous studies were explored about GLSS and FP. The research aims at analyzing of the relationship between GLSS and FP for Malaysian automotive industries. This model is called proposed research model as presented

in Figure 1.



*Note: GLSS=Green Lean Six Sigma, LF=Leadership Focus, TE=Training and Education, PM=Project Management, FP=Financial Performance, FM= Focus in Metrics.

6. Conclusion

As referred to previous research, it can be concluded that organization who implement environmentally effective can improve their financial performance. Most studies have stated that the purpose of the implementation of ‘green’ because they want to avoid waste of raw materials. Besides, it also can improve the quality by minimizing defects in the production line. Indirectly, this concept is in line with GLSS and it can help the organization to cut costs for better impact in financial performance.

However, not many studies related to GLSS associated with the automotive industry especially in Malaysia. Therefore, this study has been conducted based on proposed research model. It aims to identify the relationship between GLSS and FP practices in Malaysian Automotive Industry. Based on the previous studies and proposed research model, the hypothesis has been constructed. The next step of this study is to design a questionnaire, which will be used for pilot study data collection in automotive industry in Malaysia.

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