

Green lean six sigma, managerial innovation and financial performance in automotive industry

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ABSTRACT

Competition in the automotive industry has become increasingly in challenging tandem with time and advances in technology. Based on this situation, it is important for Malaysia to be at the top of the advanced automotive manufacturers, especially among ASEAN members. Therefore, this study aimed to prove not only product innovation as a contributor to the success of the automotive industry, but also has its own role management. By using Green Lean Six Sigma practices (GLSS) as the independent variable, it can help bring about a transformation of management which can improve financial performance. The Structural Equation Modelling (SEM) has been proposed as conceptual model in this study. Based on proposed research model and literature review, a research hypothesis is being developed.

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1. INTRODUCTION

According to the ASEAN Automotive Federation (AAF), there are seven countries listed as members of the National Industrial Association. Those countries are Brunei, Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam. While five of the country except for Brunei and Singapore implement vehicles production activities. Competition among those countries can be measure in term of development and profitability through financial performance other than looking at the marketing strategy and product development (Lansiluoto et al., 2004). Thus, according to sales volume for the year 2012, Malaysia was ranked on the third place after Thailand and Indonesia with total 627,753 units against 1,436,335 units and 1,116,212 units respectively. Similarly, the state of total output, producing 569,620 units only Malaysia lags behind Thailand's comfort at the first place with a difference of 23%.

There is an administrative principles listed in the New Public Management (NPM) named private sector management practices in which they implement managerial innovation. NPM extend the government's policy aims to renew the system in the public sector. This concept leads to several advantages of cost efficiency for the government and would not pose adverse effects on planning and objectives (Hood, 1991). To achieve satisfactory efficiency and effectiveness parallel with the level of a good economy, most organizations have done restructuring and renewal procedures (Arnaboldi et al., 2010).

To ensure that managerial innovation can be implemented well in automotive industry, organization need a concept or practice that is appropriate so that they can have a significant impact on the amount of profit to attract more customers from local and abroad. This is very important for automotive industry to remain competitive to be the best automotive manufacturers and sellers, particularly in the ASEAN region. Green Lean Six Sigma (GLSS) is the practice that is applicable in the field of management. The effects would make operating activities to be smooth, fast, reduced the number of defects, shorten the process variations and at the same time improve the quality of products and services. Moreover, integration of green with the lean six sigma practice can make the process more economical operating activities and friendly (Habidin et al., 2012).

Many studies on the GLSS practice have done previously. However, the impact of these practices on the financial performance in the automotive industry through the managerial innovation is very slightly. Therefore, this study aimed to determine the effectiveness of this GLSS practice of financial performance using managerial innovation as a mediating.

2. LITERATURE REVIEW

2.1 Green lean six sigma (GLSS)

Automotive industry is seen as an industry with the potential to evolve along with the change of time, economic fluctuations, development of technology and environmental friendly. In essence, the automotive industry in Malaysia must compete in a global context due to the higher ability than its competitors in many aspects. However, competition is not a form of other features aimed at highest eternal local market, needs to have factor of competitive advantage to penetrate markets outside.

According to Saha and Darnton (2005), companies that adopt green concepts need to obtain the commitment of all parties to get results commensurate with the effort undertaken mainly in terms of financial, social and environmental. Commitment given will assist organization to increase the quality of either culture or final goods production process, avoiding dangerous human influence and raw materials or natural resources. Therefore, it can be said that companies that adopt green concepts will be in harmony in terms of goals, process management, and material. In addition, employees are also responsible to ensure successful green practices adhere to ethical guidelines or set and system of

effective communication and relations exist not only among themselves but also with other stakeholders (Biloslavo and Trnavcevic, 2009).

Green practices may provide benefits to not only the organization, but also to the community, environmental and finance. Many global consumers will be more attracted to a product or service from conscious organizations with a concept of environmentally or green concepts. In addition, there is motivation in employees where nearly 80% of them feel more comfortable working with environmentally ethical organization (Tandberg, 2007). Therefore, this green practices can provide opportunities for practitioners to enhance its competitive advantage. Efficient management and employees are motivated to make the production process to be speed, less defects, eliminate waste and high quality.

For organizations which adopt lean practice, usually in the early stages they too focused on eliminating waste and meet the needs of existing customers in the market. This process is success in the early stages of product introduction. Over time, the trend of transformation in order to reform organization in other aspect has been changed. Among them are in the field of management. Changes in these lean practices may assist organizations be more widely explore on customers' needs, strengthen relationships with suppliers, controlling the pressure of the competition, along with advances in technology and operating or managing the challenge of facing the shareholders (Posteuca, 2011). Therefore, it is indicate that lean not only assist the organization at a satisfactory level in the early stages of production, but also to maintain the performance of the organization from different views and at each stage of the product or service life cycle.

Looking at the advantages possessed by practicing six sigma, the implementation of this practice in an organization can provides lots of positive changes and benefits in launching the process of creation and production of quality products and services. Andersson et al. (2006) states that six sigma can assist practitioners in becoming more focused in addressing the improvement process in the long term. This activity makes the organization to be getting better and quality in order to increase user satisfaction.

Furthermore, six sigma functions are not only to detecting defects in the process, but it assists to find the cause or to identify defects that prevent the opportunity of the organization to produce quality products (Antony, 2006). In other words, six sigma assist organizations find things or factor that can influence the defect in production activities. To remove defects, it must start from the root.

Thus, it was indicated that six sigma and lean are the two interdependent practices. When the organization is applying six sigma, they have neglected the change in operational processes to eliminate waste or defects and maximize product quality. But if the organization is implementing lean practices, production processes become increasingly fast and productive but at the same time it was not concerned with quality control (Arnheiter and Maleyeff, 2005).

In order to ensure GLSS practices successfully implemented in their organizations effectively, it must be supported by a number of elements. Such elements are leadership focus, training and education,

structured improvement procedure and focus in metrics. The function of those elements has been attached in the Table 1.

Table 1: Function of elements in Green Lean Six Sigma

Elements	Function of elements
Leadership Focus (LF)	In implementing process improvement, leadership is an element that could be the key to successful organizations achieve their goals (Kuei and Madu 2003). This leadership role should be focused on the creation or development of products and ensure that they continue. As a result of this leadership, it can make quality work, increased employee motivation, the objectives set in the period of time can be achieved, evaluate the results of the project as well as a culture of continuous improvement in operational and management activities (Habidin and Yusof, 2013).
Training and Education (TE)	Education is a step for practitioners to improve their skills. Skills cannot be evaluated in theory; it should be explored as to what factors influence a technique. Therefore, the practitioner will gain more experience in developing knowledge of skills. However, in terms of training, the skills exist should be trained so that the practitioner or employee can dominate the concept or practice to be implemented. When employees are fully trained, quality of work will also be in better quality (Hashim et al., 2012).
Structured Improvement Procedure (SIP)	Process improvements are needed to achieve the objectives of the organization to be better quality (Snee 2010). Therefore, the structured improvement procedure is an element that can support process improvement, resolution of issues in management, productivity improvement and dissemination of knowledge. This element is needed in the planning process design or management restructuring in accordance with the procedure (Zu et al., 2008).
Focus in Metric (FM)	The function of metric is to provide an understanding of the process operation, assist organization make decisions in the selection of practices as well as an incentive to employees to improve the quality of work (Arnheiter and Maleyeff 2005). When employees have understood the concept of operations and skills, focus in metric will guide employees towards the goals set by organization to improve the quality of management (Linderman et al., 2003; Habidin and Yusof, 2013).

2.2 Managerial innovation

In order to make organizations achieve their objective to finding competitive advantage, innovation is a strategic decision to be implemented. This encompasses innovation in process development, manufacturing technology, employee performance development and product innovation. Progress in these processes can distinguish this from other organizations (Prajogo and Sohal, 2003). Moreover, as

the impact of the learning process and the development of knowledge, innovation can provide a significant advantage where it can improve management efficiency.

Innovation is not only limited to be applied to the product, but it also requires combination of various factors. The process of innovation can give a positive impact on individual motivation, customer response, and planning of management goal and interactive in development stage (Biemans, 1990). According to Quinn (1985), managerial innovation can control the chaos as the occurrence of an uncontrollable situation or surprise. It can be said that, managerial innovation also can be implemented in a desperate situation and take a short period of time.

Considering automotive industry is not only limited domestically but imported from outside activities also make competition in the automotive industry to be more extensive. This has influenced the product life cycle to become shorter. Apart from intense competition, with the advent of technological advances that facilitate the production method also make life become increasingly short. As such, the market will be different and niche according to the increasingly complicated because they demand the product to be more specific characteristics (Birchall et al., 2001; Becker, 2006; Chanaron and Rennard, 2007). This condition forces the organization to be more careful in dealing with the challenges and problems that arise. For this reason, innovations must be implemented not only in technology, but it needs to be balanced with the efficient and effective management.

According to Drejer (2002), innovation is the result of implementation of the changes activities, while managerial innovation is for management activities to control processes to ensure successful innovation. It can be said that managerial innovation implementation starts from the first stage of idea generation to build the product or process until the implementation of market development.

Traditionally, organizations typically plan the production process or the creation of a product at a very early stage. For the impact, no transformation or innovation has been made by the organization to improve product quality. This adversely affects the market opportunity for the customers' needs are constantly changing (Holtzman, 2007). Therefore, the organization needs to perform process of managerial innovation from time to time so that they remain in line with the circulation of technology and customer requirements.

Managerial innovation will become more efficient and implementation is more thoroughly when it is supported by a number of factors. Among these factors is the knowledge management, creativity skills and customer perspective. Description of these factors is state in Table 2.

Table 2: The factor that influence implementation of managerial innovation

Factor of Managerial Innovation	Elaboration of factor
Knowledge Management (KM)	The main purpose of KM is assist organization to implement the process of innovation in order to facilitate the generation of new ideas and diffusion in each level of the organization (Levett and Guenov, 2000). Knowledge management will serve as gathering information to help accelerate product development, shortening the time for the

Factor of Managerial Innovation	Elaboration of factor
	product to penetrate new markets and product life cycle cost (Stalk and Hout, 1990).
Creativity Skills (CS)	Creativity can be defined as a technique that involves the creation or generation of ideas in creation of new products or procedures that would benefit the individual or a group that works together (Shalley, 1995). There are parties opposed thought creativity skills guarantee successes in innovation (Munoz-Doyage and Nieto, 2011). In the successful implementation of the innovation and quality are individually responsible for contributing the idea that innovation can be implemented in a planned (Rothwell, 1994).
Customer Perspective (CP)	CP is a method that requires an organization to take care of customer needs, identify their dissatisfaction and be able to predict the needs of customers in the changing conditions. Therefore, CP can be implemented with the creation of customer relationship management, customer satisfaction analysis, efficiency in solving problems and ensuring that all employees are committed to their customers (Habidin and Yusof, 2013). As a result, organizational performance could be improved (Zakuan, 2009).

2.3 Financial performance

Competitive advantage does not necessarily force the organization to produce a unique product or have a range of features required. With fast production process but has good quality and the low cost involved is also key that enables organizations to attract customers in improving sales volume. According to the perspective of innovation, low cost does not necessarily involve the price of one unit of product or service; it can also be calculated by reducing the cost per unit of performance such as time, generating energy or raw materials (Holtzman, 2007).

Furthermore, organizations that undertake production activities easier to increase profits if they perform innovation compared to organizations that do not transform their process or product management to be more innovate (Tidd et al., 1997). Profits and changes in the organization said to be related because of the current economic situation fluctuate is not possible to make the financial performance of the organization are always flexible or stable. Organizations must find a way to ensure that the products or services they can provide benefits to the organization. According to this condition, the transformation should be carried out using appropriate practices.

When organizations have the initiative to innovate the management or production of products and operations, the most important thing to evaluate is the financial performance. Because it is an important pillar for the movement activities of the organization's current or future. Thus, there are several methods or to evaluate the effectiveness and suitability of the implementation of new practices that may affect

innovation. Financial performance evaluation is divided into three stages: pre-production, production process and evaluation after sales.

2.4 Pre-production strategy

At the first stage, the most important thing to be evaluated is the capital. Capital that should be used wisely. The main problem in reducing the amount of profit and output is that when capital flows are not used properly (Sarwar et al., 2012).

In a study on the use of capital, they have suggested that creating an area that could evaluate the productivity, planning and implementation. It aims to assess the efficiency and effectiveness of the input source. Results from this division, the organization will be smarter in arranging and generating profit for its financial performance.

2.5 Production process

When the implementation of GLSS practice becomes essence to managerial innovation, it will directly shift the product life cycle and parallel with the fluctuation of customer requirements in the automotive industry. Controlling cost and planning purchases affected the returns from the integration of the practice after the organization had achieved the objective of improving the quality of products and services in which they can expand profits and market (Wei and Chen, 2008).

If the organization are aim to implement the integration of practice, the recommended practice to be applied in an organization should be tied to organizational goals, especially in financial performance (Vitale and Mavrincac, 1995). This is because; all the effort and planning new strategies will be wasted if it does not achieve the desired objectives. Therefore, the organization should set and understand their objective, plan a suitable practice and measure whether it will achieve the goal.

2.6 Evaluation after sales

Assessment of financial support not only needs to be taken into account during the planning period to the sales revenue (Levitt, 1983). Financial arrangements remain all the time as long as the organization is still operating. This is because, even after sale, the organization should consider what steps should be taken to ensure their profits multiply.

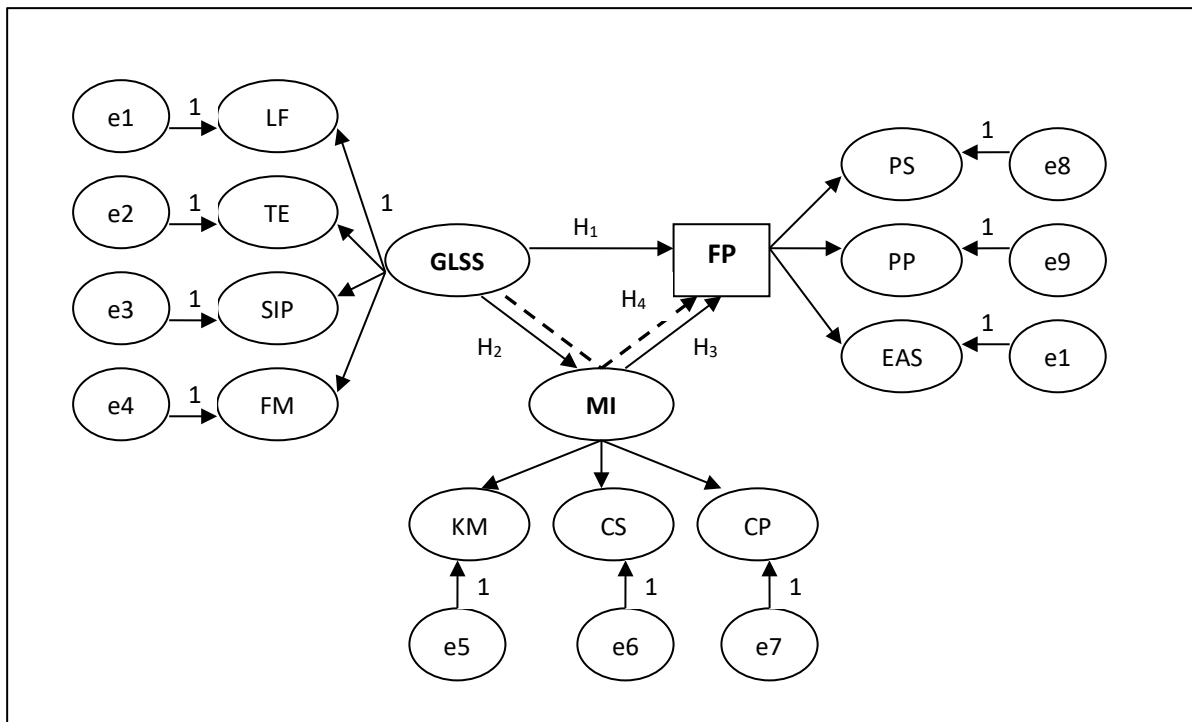
In the study by Saccani et al. (2005), they investigate about the after sales performance. Operating profit, return on assets and return on inventories measuring instruments to indicate financial performance (revenue and efficiency of resource use) can be influenced by the market as market penetration or market share. Furthermore, an assessment of the progress and innovation can give directions to the organization in financial planning in the future in creating competitive advantage (Gaiardelli et al., 2005).

3. RESEARCH METHODOLOGY

Objective of this study is to investigate the practices of Green Lean Six Sigma (GLSS) and Financial Performance (FP). For the next step, the study will make the Managerial Innovation (MI) as a mediating variable in which it works to assist conceptualize and explain the influence of GLSS and FP. Besides, as a mediating variable, MI will assist GLSS work in any situation.

The study is going to use a quantitative survey which is the data generally gathered through structured question. It is implemented in automotive industry. Automotive industry was chosen because this industry is a massive, large scale manufacturer, competitive and global industry (Bradley et al., 2005; Kuik, 2006; Conding et al., 2013). In addition, this industry uses the quality performance measurement in which very important (Zakuan, 2009) to determine the impact to the financial performance. In order to achieve the objective of this study related to the automotive industry, PROTON Vendor Association (PVA) and Kelab Vendor PERODUA (KVP) were selected as the population. To gain the validity of comment and feedback, a set of questionnaire are design carefully to ensure the issues arising are related with GLSS, MI and FP. The statistical Package for the Social Sciences (SPSS) version 17 was used to analyse the preliminary data and provide descriptive analyses about thesis sample such as means, standard deviations, and frequencies.

Structural Equation Modelling (SEM) technique was adopted to determine the relationship between variables in the research constructed model. Exploratory factor analysis, reliability analysis and confirmatory factor analysis to test for construct validity, reliability, and measurements loading were performed. Having analysed the measurement model, the structural model was then tested and confirmed.



Notes: GLSS=Green Lean Six Sigma, LF=Leadership Focus, TE=Training and Education, SIP=Structured Improvement Procedure, FM=Focus in Metric, MI=Managerial Innovation, KM=Knowledge Management, CS=Creativity Skills, CP=Customer Perspective, FP=Financial Performance, PS=Pre-Production Strategy, PP=Production Process, EAS=Evaluation after Sales

Figure 1: A proposed conceptual model of GLSS, MI and FP in automotive industry

3.1 Research hypotheses

Stakeholders are satisfied with the financial performance of the organization which can improve workers, consumers and resources. This satisfaction can be achieved through advances in technology and services that are environmentally friendly or management of the profit can be increased through the creation of new business opportunities (Esty and Winston, 2006).

Whereas based on six sigma reviewed, it is believed to give a positive relationship with profit organizations (Freiesleben, 2006). Among the advantages is to minimize defects in the process, maintenance inspection period is short, the increase in the cycle, bringing the inventories in large quantities, saving capital expenditure, lower operating costs, increased productivity, the number of customers unhappy decreasing and increasing the amount of profit (Antony et al., 2005; Kwak and Anbari, 2006).

Principles of lean and six sigma is a process improvement that can be implemented where it has a positive impact on financial performance and launch service provision in terms of cost and manufacturing quality (Johnstone et al., 2011). Therefore, from the previous research, it was indicated that the integrated of green lean six sigma (GLSS) practice are able to make organization improve their

financial performance. It was clearly assist this study to construct hypotheses as stated in numbering system from H1.

H₁: There is a positive and direct significant relationship between green lean six sigma (GLSS) practices with financial performances in automotive industry.

Lean functions as a tool to speed up the production process. In addition, lean very useful to assist organizations seek the customer satisfaction by producing quality products (Li et al., 2005). This occurs because, lean practices can help eliminate waste and ensure its implementation process is carried out continuously. Therefore, many studies have shown that lean is a practice that can give an advantage to the organization through the implementation objectives. Among the objectives of lean is to ensure smooth production process but at the same time still maintaining product quality. In addition, lean to save costs by reducing the amount of labour usage, shorter delivery times and reduced production costs after the process improvements made from time to time. As a positive effect, organizations benefit from the implementation when it is able to achieve the specified performance (Womack et al., 1990; Imai, 1997; Doman, 2007; Forrester et al., 2010; Habidin and Yusof, 2013).

Six sigma practices have its benefit. It works to reduce or eliminate the number of defects in which the results can improve customer satisfaction through quality products and increase the profit of the organization (Habidin and Yusof, 2013).

For the impact, the integration of two practices can help organizations focus on the development of the operations in order to improve customer satisfaction, cost savings and competitive advantage. With a combination of green into lean six sigma, it can make management more productive because of the elimination of waste and defects in the product can be maintained while the implementation and enhance the image of the automotive industry (Kumar et al., 2006). Therefore, this discussion leads to the following hypothesis:

H₂: There is a positive and direct significant relationship between green lean six sigma (GLSS) practices with managerial innovation in automotive industry.

Efficiency can be assessed by financial performance when the organization was able to keep up with the time-based global economy (Nanni et al., 1990). Therefore, the customer perspective and internal business perspective is said factors that could affect the performance of the strategy and long-term goals (Kaplan and Norton, 1992; Vitale and Mavrinac, 1995).

However, there is issue regarding how far the financial performance will give advantage to the organization if it is set as target performance. Golhar and Deshpande (1998) suggest that attention should be given to customer satisfaction and business process or management as specific. This is due; in full concentration on the financial performance may not be enough to help organizations compete globally.

The factors that influence the development of the organization should be considered, with the productivity of the financial performance will also be able to move with balanced. It means that financial performance movement are strongly depending on how the organization arranges their internal structure or management.

H₃: There is a positive and direct significant relationship between managerial innovation practices with financial performances in automotive industry.

In some previous studies have shown that the GLSS has been used as a practice to be applied in the management and production (Arnheiter and Maleyeff, 2005; Peattie and Crane, 2005; Rao and Holt, 2005; Simpson and Power, 2005; Wadhwa et al., 2006; Taylor and Taylor, 2008; Habidin and Yusof, 2013). Each of these practices (GLSS) has given the advantage to the organization through their respective functions. This practice also helps organizations in doing innovation or change in management or operational activities. However, there still has not been many studies done to evaluate the effects of managerial innovation practices GLSS and financial performance. To fill this gap, hypothesis H₄ was built to see its effectiveness to achieve the goal of the study.

H₄: There is a positive and direct significant relationship between GLSS, managerial innovation and financial performances in automotive industry.

4. CONCLUSION

This study aims to review the relationship between Green Lean Six Sigma (GLSS) and Financial Performance (FP) with the use of managerial innovation (MI) as a mediating. In addition, this study was intent to determine whether it is suitable to be applying in the automotive industry. In related to that, the proposed model and hypothesis is developed based on literature review to indicate that GLSS are become most important practice to increase the financial performance of an organisation. The quality of management may produce a better product and make employees of an organisation more motivated. As such, it is expected to give a positive effect for manufacturers or practitioners in automotive industry.

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