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LEAN MANUFACTURING PRACTICES AND MANUFACTURING PERFORMANCE: THE MODERATING EFFECT OF ETHICAL CLIMATES

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Abstract

Manufacturing performances is a strength of firms are determined based on the capability or output that commonly used to observe and manage operational efficiency, reflect the current state of manufacturing conditions and engage to the effectiveness of manufacturing decisions that lead to the performance of the company. Many manufacturing company applied lean manufacturing in order to boost the performance. Indeed, a set of lean practices were used to improve manufacturing performance. Consequently, Lean Manufacturing Practices (LMP) is the best way of utilizing practices that influence manufacturing performance in organization. Several scholars used single practice whereas others used bundles. Nevertheless, lack of studies related to the single practices compared to the bundles practices. A number of studies have reported mixed findings; hence, a moderating variable is suggested. This paper proposes Ethical Climates as potential moderator on the relationship between LMP and manufacturing performance to enhance the relationship.

Keywords: Lean Manufacturing Practices, Manufacturing Performance, Ethical Climates

Introduction

In the growth of the country, the importance role should be played by industrial sector in order to ensure the development of economy. Subsequently, the particular organizations should improve their performance in order to endure relevant, competitive and sustainable in present market which is increasingly complex, unreliable and vibrant environment. Furthermore, current manufacturer have to reach world-class status by considering the importance of manufacturing performance so that to be able to compete excellently in worldwide market (Dangayach & Deshmukh, 2001). Manufacturing performance is refer to the strength of firm is ascertained based on the capability or output provided such as cost, quality, delivery time and delivery time reliability, performance, flexibility and innovativeness to satisfy customer (Narkhede, 2017). Meanwhile, study by Karim & Arif-Uz-Zaman (2013) defines and evaluates the manufacturing performance indicators based on production quality, processing time and cost which had been used

to measure performance of the company. On the other hand, Alaskari, Ahmad, & Pinedo-Cuenca (2016) in their study mentioned that most of the manufacturing company implemented lean manufacturing in order to boost the performance. In fact, performance measurement can help public organizations to establish organizational efficiency. Likewise, according to Narkhede (2017), the capabilities of manufacturing performance can be enhanced by decreasing manufacturing outputs such as the cost, quality, delivery time and delivery time reliability, flexibility and innovativeness.

Besides, the manufacturing organizations challenge to endure in the current business market and also in internationally competitive markets. Consequently, these factors present an obstacle to the manufacturing organizations to discover the suitable tools and approaches so that able to become competitive advantage in the current industry. As a result, study by Bhamu & Sangwan (2014) found that LMP is a suitable tool and practice in order to help the manufacturing organizations to survive in the market. Moreover, Singh, Kumar, & Gupta (2014), mentioned that lean manufacturing is philosophy that refer to the Toyota Production System and other Japanese management practices that attempt to save eliminate waste and unnecessary activities in the firms. Numerous studies had use lean bundles or grouped lean to measure performance for example, Shah & Ward (2003) had categorized lean manufacturing into four bundles that each bundle comprises principles and tools such as Human resource management (HRM), Total Quality Management (TQM), Just in Time (JIT and Total. Preventive Maintenance (TPM). Each of bundles has their own types of lean tools and practices.

In contrary, according to Hines, Holweg, & Rich (2004), their study have defined lean at two levels which is comprises strategic level and operational levels. Likewise, study by Olsen (2004) had defined lean practices as a supportive practices that categorized lean into four wide areas such as JIT, TQM, TPM, and infrastructure. Meanwhile, according to Worley & Doolen (2006), management support and communication have been proposed to support lean manufacturing practices, as well to drive the implementation of lean in order to see the great impact of organizational performance. Notwithstanding, even though previous researchers and practitioners have attempted to identify the main lean manufacturing practices but there was no single agreement among them regarding the relative importance of the practices (Nawanir et al., 2013; Ahmad et al., 2003). Normally author's backgrounds reflect to the types of practices. However, the concept remain the same although have different sets of practices.

Some of studies have demonstrated ethical climate represented as a moderator in concurrence of organizational context. The study from previous scholars had found Ethical Climate as a good predictor on organizational performance (Sabiu, Mei, & Raihan Joarder, 2016). Study by Anaza et al., (2015) was examine the connection between ethical climate and features of job satisfaction amid organizational buyers. The important result was that buyer's organizational policy mediates the connection between buyers' perception of ethical climate and buyers' satisfaction with salary and promotion as well as satisfaction with co-workers and supervisors. Contrariwise, study by Appelbaum et al., (2005) was accomplished a literature review of the current body of empirically-based studies connecting to the causes and consequences of in what way the ethical climate of a company eventually affects the occurrence of workplace abnormality.

Consequently, obviously, unethical and unexpected behavior problems are of great anxiety to organizations, which must take steps to resolve them, at the same time as development strong positive ethical cultures.

On top of that, Choi, Moon, & Ko (2013) has conducted a research in order to study how an organization's ethical climate positively connects to its financial performance by considering an organization's innovation, a support for innovation and performance evaluation. The results indicate that an organization's ethical climate is positively related to financial performance. In the meantime, González & Guillén (2002) stated that the organizations need to put some attention pertaining ethics in order to ensure the quality of work. Therefore the organizations need to adopt a code of ethics, and including the code in the Lean values since the code of ethics is one of the important mechanisms that organizations need to fully adopt and implement which is derived from the leader. Moreover according to Maguad & Krone (2009), ethical excellence should be integrated together into continuous improvement process to sustain the quality of deployment.

Hence, the aim of this paper is to propose Ethical Climate as a role of moderating effect on the relationship between LMP and manufacturing performance. This study proposes lean manufacturing practices comprises to two (2) components which are cellular layout and pull system/ Kanban. The paper is comprises into six parts which are introduction, literature review, research framework, underpinning theory, methodology and conclusion.

1.0 Literature Review

Lean manufacturing drives back as far as 1978 when Ohno wrote his book on the Toyota Production System (TPS) in Japanese. The idea of lean manufacturing was founded by a Japanese automotive company, Toyota, during 1950's which was well known as Toyota Production System (TPS) (Nordin, Md Deros, & Wahab, 2010). It could be said that the 'lean' principles caused from the broader community outside Japan, as a react to the mass-production system that was practiced in most American and European companies after the Second World War (Herzog & Tonchia, 2014). The main goal of TPS was to decrease the cost and to increase productivity by eradicating wastes or non-value added activities. During 1980's there was an penetrating interest on lean manufacturing implementation among the western manufacturers because of rising Japanese imports (Nordin et al., 2010). Ohno (1988) mentioned that the solution offered by Toyota led to a complete reconstruction of the company and soon gave way to the introduction of an alternative production system indicated to as the Toyota Production System (TPS) which aimed at directly attacking any form of waste in the production process. Besides, the JIT philosophy was refined in the framework of this new production system and developed exactly out of the need of the Japanese industry to endure in the post-war global market.

Lean is a term invented by Krafcik (1988) who a chief researcher in the International Motor Vehicle Program (IMVP) executed at the Massachusetts Institute of Technology (MIT). In his landmark paper Krafcik introduced the term "Lean" in order to portray a production system that uses fewer resources of the whole thing compared to mass production. Nonetheless, many researchers define lean differently. Consequently, Bhamu & Sangwan (2014) has reviewed on the

lean studies and summarized the term that had been used to define lean. The result from the review shows that lean had been define as a way; a process; a set of principles; a set of tools and techniques; an approach; a concept; a philosophy; a practice; a system and many more.

Yet, even though there are many definition of lean but there were one aim which is to eliminate waste (Shah & Ward, 2007). In fact, the frequent cited list of lean principles found in the literature was suggested by Womack & Jones (1996). However, Liker (2004) extended the principles that created by Womack and Jones (1996) by highlight on the 'matters of people' in his principles. Liker (2004) mentioned that a particular organization will consider as a lean organizations when it develop and deploy lean principles properly. It will not consider as lean organization despite it uses a variety of TPS tools if not practices correctly. Nonetheless, Hallgren & Olhager (2009) stated in their study that before lean is introduced, just-in-time (JIT) system or Toyota production system was the precursor of lean manufacturing with the effort and combination attempt from Taiichi Ohno, Shigeo Shingo and Yasuhiro Monden as notable of the rise of JIT/TPS/lean in the 1980s. According to Hallgren & Olhager (2009); Schonberger (2007) the ideas and methods under the lean label were the same as those of JIT that came before. However, JIT is not created with the particular principle as lean. Womack & Jones (1996) has deliberated lean to be the five important lean principles as follows:

i. Identify what does add value to the customer and what does not generate value as well.
ii. Highlight non-value adding waste across the entire value stream process.
iii. Do actions that add value flow without interruption.
iv. Do services which are only pulled by the customer.
v. Attempt for perfection by removing consecutive layers of waste as they are uncovered.

These principles have been a reference as a guideline for waste elimination. Lean practices have several tools at its disposal based on these principles. The implementation of lean relies on two main pillars, namely Just-In-Time (JIT) and Jidoka (Jekiel, 2011). Just-In-Time is the technique of providing the right quantity at the right time and the right location whereas Jidoka is the Japanese word for autonomation which is roughly translated mean quality at the source. It is human intervention in an automated process to avoid the production of unacceptable quality. The Jidoka production mindset can be extended to the maintenance function when quality at source thinking has become part of the workforce culture (Aikens, 2011). In addition, the implementation of lean manufacturing practices leads to improvement of the performance in the industry (Melton, 2005).

1.1 LMP and Manufacturing Performance

Alaskari et al., (2016) mentioned that utmost of the manufacturing firms executed lean manufacturing in order to boost the performance. In fact, a set of lean tools used to improve manufacturing performance thereby it is respond to market demands in various dimensions, such as enhanced product quality, faster delivery and lower cost. The term manufacturing performance

has been used in the manufacturing company for a long time. However, the term operational performances also been used in the previous research, yet still remain the same definition. Therefore, operational performance and manufacturing performance using the same metrics in order to monitor and measure the performance and efficiency in the particular organization (Tan & Wong, 2015; Hon, 2005). Likewise, Voss, Ahlstrom, & Blackmon (1997) also using the term manufacturing performance in order to describe about operational performance. They discuss manufacturing performance in three dimensions comprises of quality, productivity and cycle time. Most likely the previous studies mentioned that manufacturing performance conventionally discussed from the aspect of priorities of quality, delivery, flexibility, time and cost. Nonetheless, there were also a few studies using another metrics such as inventory, productivity, customer satisfaction, diversity, weighted performance and flow to measure manufacturing performance and operational performance.

Melton (2005) highlighted the key tools and techniques within the lean system for example Kanban, 5S, Poka-Yoke, Single-Minute Exchange of Dies (SMED), visual control and many more that lead to improve the manufacturing performance. Bhuiyan, Baghel, & Wilson (2006) stated that lean production was one of the oldest improvement methodologies, providing high value to the customer via the use of best practices such as 5S, mistake proofing and Kanban. Besides, Ahmad and Benson (1999) identified Kanban, Taguchi, Kaizen, pinch technology, just in time (JIT), statistical process control (SPC), business process reengineering (BPR), failure mode and effect analysis, total productive maintenance (TPM), SMED, Poka-Yoke, agile manufacturing and flexible automation and intelligent manufacturing as the most appropriate tools for the improvement of manufacturing performance. Meanwhile, study by Karim & Arif-Uz-Zaman (2013) defines and evaluates the manufacturing performance indicators based on production quality, processing time and cost. The indicators that had been used were able to measure performance of the company. In addition, according to Narkhede (2017), the capabilities of manufacturing performance can be improved by reducing manufacturing outputs such as the cost, quality, delivery time and delivery time reliability, flexibility and innovativeness. The present study hypothesizes that:

H_1: Lean Manufacturing Practices positively relates to Manufacturing Performance.

1.1.1 Cellular manufacturing

Cellular manufacturing is a process of tools and workplaces are organized in a structure that supports a smooth movement of materials and components through the process with lowest conveyance or delay (Suzaki, 1985). In fact, it can helps to eradicate the waste resulting from conveyance and unnecessary motion ‘3M’ which is comprises of men, machinery and material. According to Stemhanou & Spiegl (1992), the possibility of making changes and at the same time maintaining competitive price structure makes the application of cellular manufacturing whereas Fullerton et al., (2003) had defined cellular manufacturing as a gathering and forming common concepts, principles, problems, and tasks. It evades needless duplication through standardization. It contains sequencing similar parts through the same machine and creating manufacturing cells for processing. Most of the organizations that transformed to lean production were used cellular

manufacturing as a means of transition. Nonetheless, the human element of the transition to cellular manufacturing was passed over in the design of the cell (McDonald, 2004). According to Chung (1996), inadequate attention to the human element was frequently cited cause of the failure of advanced manufacturing. For instance, at the early stage of lean development, Taiichi Ohno has transformed the emphasis from machine and workstation optimization to product flow through the total process, implementing some changes like dimensioning the manufacturing resources based on actual demand, improving the self-monitoring capabilities of equipment to ensure quality (Jidoka), designing the process layout to enable the sequence of the operations (Group Technology), studying and refining quick setups to allow rapid changeovers (SMED) and the use of Kanban to organize the production pull from and link one workstation to another and also to connect the company with its suppliers and enable JIT supply (Duque & Cadavid, 2007) . Meanwhile, study by Bhat (2008) proposes a method for introducing Cellular Manufacturing in a small-scale industry. Cellular Manufacturing was applied in the production in order to produce part families with similar manufacturing processes and stable demand, plants expect to reduce costs and lead-times and improve quality and delivery performance. Cellular manufacturing is an approach that helps build a variety of products with as little waste as possible. Equipment and workstations are arranged in a sequence that supports a smooth flow of materials and components through the process, with minimal transport or delay. Consequently it can increase the manufacturing performance in terms of quality, delivery, flexibility, time and cost. Concurrently, Womack & Jones (1996) mentioned that lean production cells are characteristically U-shaped or rectangular and play their role s to 1) smooth (balanced) work flow across a wide variety of products, 2) elimination of waste, 3) high quality output, 4) flexible operation, and 5) low total unit production costs. On the other hand, study by Duque & Cadavid(2007) found that cellular manufacturing made possible to deal a wide diversity of products in a sequence that reflected more closely the market's demands, reducing lead times and eliminating the need for large volumes of inventory. Therefore, the hypothesis (H_{1a}) is developing as below:

H_{1a}: There is a relationship between cellular manufacturing and manufacturing performance.

1.1.2 Pull system/Kanban

Kanban is the marking system for emerging JIT production which is a visual signal helps flow by 'pulling' products through the process as required by the customer. According to Ohno (1988), the operating method of the Toyota production system is Kanban. There is several functions of Kanban such as arrange for pick-up or conveyance information, provides production information, averts overproduction and extreme conveyance, serves as a work order attached to goods, avoids flawed products by recognizing the process making the defectives and discloses existing problems and sustains inventory control. According to Mollenkopf, Stolze, Tate, & Ueltschy (2010), most of global supply chains traditionally use push methods, despite the fact that lean is more compatible with pull methods of inventory control in order to reduce the cost in the manufacturing performance. Meanwhile, according to Womack & Jones (1996), non-value-added activities or wastes such as unnecessary motion, excess inventory, waiting, quality defects, over-processing, unnecessary transport and overproduction need to eliminate or reduce by implementing lean manufacturing practices such as pull systems, cellular manufacturing and many

more . Consequently, it can to improves the competitiveness of organisations by reducing inventories and lead-times, and improving productivity and performance (Garza-Reyes, 2013). Likewise, Prasad, Khandua, & Sharma (2016) also agree with the previous researcher which is by eradicate wastes, by implementing a variety of practices for instance pull system, cellular manufacturing, setup time reduction, total productive maintenance (TPM), total quality management (TQM), and continuous improvement able to resulted a good manufacturing performance. Correspondingly to the goal of lean principles is not to merely simply deal with eradicate of wastes then again also to make certain that the flow of production is smooth and well-organized (Liker, 2004). Likewise, study by Lissa, Millller, & Greene, (1991) found that the implementation of Pull production system able to influence throughput, flexibility, quality and material flow in the production and inventory. Therefore, the hypothesis (H_{1b}) is developing as below:

H_{1b}: There is a relationship between pull system and manufacturing performance.

1.2 Ethical Climates as a potential moderator on the relationship beween LMP and Manufacturing Performance

Ethical climates have been essential issues in the organizations that contribute to the company's performance. In the meantime, the occurrence of unethical behaviors within business organizations has been widely discussed and increasing concern. Therefore, it is the main concern of all bodies neither professionals nor disciplines to discover all potential ways of creating ethical behavior and activities within the business organizations (Arulrajah, 2015). Ethical climates is a perceptions of ethical either doing correct or wrong that should be handle in all organizations in order to ensure the productivity of organizations can be maintain in the good performance (Victor & Cullen, 1987). Besides, ethical climates can affects both decision making and performances in the organizations (Martin & Cullen, 2006). Stare & Klun (2017) mentioned that an ethical climate is representing the organization's policies, procedures and practices on ethical issues. As a result, it can be as a reference for employee behavior as it can influences employees' attitudes and behavior. Hence, it is a part of the larger organization culture (Fournier, 2010; Appelbaum, Deguire, & Lay, 2005) but Martin & Cullen (2006) conceptually classified ethical climate as a type of organizational work climate (Martin & Cullen, 2006).

The organizations need to fully adopt and implement the company's code of ethics in order to succeed in lean implementation (González & Guillén, 2002; Maguad & Krone, 2009; Sneider & Carries, 2008). Besides, lean and ethics need to integrate and walk "side by side" to gain the best results and involve co-workers who can acknowledge the ethical codes in their task with their customers and carrying out regular work. In fact, according to Ljungblom (2014) it is essential to compare the values lean stands for with the ethical codes used in the industry in order to identify potential interactions and misaligned. Furthermore, the finding research executed by Long & Driscoll (2008) shows that an ethical climate able to increase organizational performance. Therefore, pertaining the positive effect of an ethical climate, meanwhile prior studies have emphasize on the interrelation between an ethical climate and organizational performance yet

investigation of the mechanisms by which an ethical climate improves performance has been slightly ignored (Koo et al., 2014). The present study hypothesizes that:
H2: Ethical Climates relates to the Manufacturing Performance
H3: Ethical Climates moderates the relationship between LMP and Manufacturing Performance.

1.3 Proposed Conceptual Model

The research framework will be framed to examine the moderating role of Ethical Climates on the relationship between LMP (Cellular manufacturing and Pull system/Kanban) and Manufacturing Performance that to be tested in Manufacturing Organization in Malaysia. RBV theory suggested that internal resources leads to competitive advantage in an organization. Based on the above stated justification the researcher intended to employ LMP as Independent variables and Manufacturing Performance as Dependant Variable whereas the Ethical Climates as the moderating variable. Past studies found Ethical Climates as a strong predictor of organizational performance (Sabiu et al., 2016), others prior studies tested EC as moderator on the relationship between job satisfaction and organizational commitment in Turkey (Zehir, 2012), African context (Nafei, 2015) result of the previous studies explained positive moderating effect. Based on the above empirical evidences, a proposed conceptual model for this study illustrating the moderating effect of Ethical Climates on the relationship between LMP and Manufacturing Performance is depicted in Figure 1.

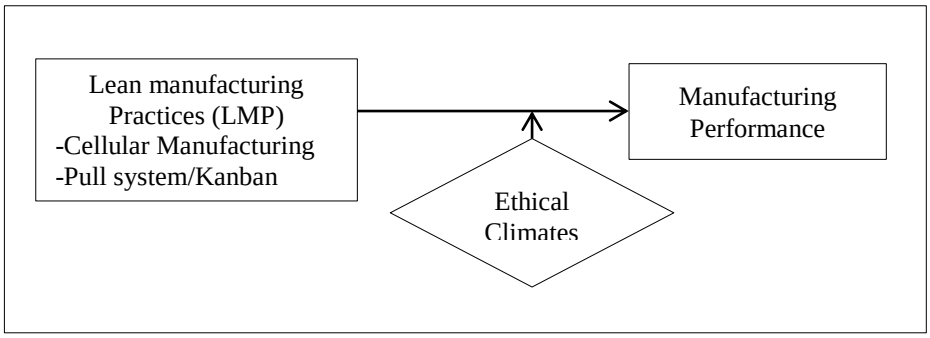

Figure 1: Proposed conceptual model

1.4 Underpinning Theory

The resource based view (RBV) is an underpinning theory on this study. RBV of a firm has been used for long time ago and source can be followed back to before query about the originators Barney and Penrose. RBV occurred somewhere around 1983, 1984 and the mid-1990's (Barney, 1991). The RBV debated that organizations have funds, a subset of which authorizes them to achieve competitive advantage, and a subsection of those that quick predominant long haul performance. Yet again, RBV highlighted that human capital asset creates competitive advantage and improve organizational performance through employees behavior. Fundamentally, RBV is

represented as a direction and application of relational LMP to support organization to reached competitive advantages towards manufacturing performance. In a short sentence, LMP adoptions would be the resources and capabilities that used to improve the manufacturing in Malaysian manufacturing industry. In RBV perspective, Ethical Climates has been linked to add value to LMP and Manufacturing performance in the aspect of play an important role to reach organizational accomplishment. Ethical Climates highlights on having strategic value for organization and how human resource systems may help that value to achieve result. In general, based on the stated argument, the present study intends to use RBV to explain the proposed research framework.

1.5 Proposed Methodology

The present paper intends to use quantitative method which is a primary data will be collected using questionnaire. The focus of this study is among Manufacturing organizations in Malaysia. The sample to be use is 335 from the total population of 2368 based on Krejcie & Morgan (1970). Meanwhile, PLS SEM will be use in the data analysis.

2.0 Conclusion

This paper has proposed Ethical Climates as the role of moderating effect on the relationship between LMP and Manufacturing Performance as depicted in Figure 1. Finding will provide useful and vital input to the Manufacturing organizations, academics and practitioner into the significant direct effect of LMP on Manufacturing Performance and also the direct effect of Ethical Climates on the relationship between LMP and Manufacturing Performance in Malaysia manufacturing organization.

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