



RELATIONSHIP BETWEEN LEAN MANUFACTURING AND BUSINESS PERFORMANCE: A CONCEPTUAL MODEL BASED ON LIBYAN MANUFACTURING INDUSTRIES

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ABSTRACT

Libya is among the few developing African economies. After the war in 2011, Libyan manufacturing industries was nurtured to offer better products and services as part of the Libyan government plan to rebuild their economy and improve their industry. Lean manufacturing is one of the improvement initiatives that can be used to boost industrial performance by eliminating of waste and enhancing value-added activities. The main purpose of this paper is to propose a relationship model between Lean Manufacturing practice and business performance with mediators of People Development and Process Improvement based on the Libyan manufacturing industries. The Structural Equation Modeling (SEM) techniques are used to examine the relationships of the practices. The contribution of this paper would be a conceptual model that will help the academicians and industry practitioners to have a better understanding of the relationship between the Lean Manufacturing practices and business performance, especially related to the Libyan manufacturing industries.

Keywords: business performance, lean Manufacturing, people development, process improvement.

INTRODUCTION

Lean Manufacturing is one of the improvement initiatives that can be implemented to achieve business excellence (Mohammad, Mann, Grigg, & Wagner, 2011) the concept of "Lean" was introduced in 1980s by a research 'group in Japan, they studied Japanese style of manufacturing called Toyota Production Systems (TPS) (Womack, Jones, & Roos, 1990). "Lean" described as a philosophy of manufacturing that incorporates a collection of principles, tools and techniques into the business processes to optimize time, human resources, assets, and productivity, while improving the quality level of products and services to their customers (Čiarnienė & Vienažindienė, 2012). In order to create the foundation for lean manufacturing to take hold, a significant organizational change must occur within the organization (Nordin, Deros, Wahab, & Rahman, 2012).

In this competitive business world, many companies are improving their performance, especially on an ongoing basis and customer interest. They are implementing various methods to achieve optimum performance. To be able to improve the efficiency, most companies concern about increasing their performance management, where managements are always seeking for a better ways to minimize cost incurred in production and services. One way to do it is by eliminating waste in the production process, and focus on the processes that has added value for customers. Such strategies to have efficient production process is often called lean manufacturing. The aim of Lean manufacturing is to eliminate the waste and creating a more efficient production process. Nowadays the implementation of Lean Manufacturing not only in automotive industries, but it has spread to other industries and organizations. (Erfan, 2010) stated that there are four steps in

implementing lean manufacturing. They are;

1. Identifying the fact that there are wastes to be removed.
2. Analyzing the wastes and finding the root causes for these wastes.
3. Finding the solution for these root causes, and
4. Application of these solutions and achieving the objective.

Libyan manufacturing industries developed significantly in 1960's after the oil and natural gas was discovered. Since then, the country has turned to industrialization by engaging in petroleum processing as well as iron steel, cement and textile industries. Libya is the fastest growing country and the one of the developed country in Africa (Hokoma, Khan, & Hussain, 2008).

This study will analyse the Lean Manufacturing practice and business performance in the Libyan manufacturing industries. From previous studies in Libya, lean manufacturing was not only implemented in manufacturing industry, such as in the cement industry, healthcare industry and iron steel industry only. But also in other sectors in general.

Generally Libyan manufacturing industries is still unaware of the benefits of lean manufacturing, due to the problems and difficulties that are associated with the system application, which are people and factories. As such the application of lean manufacturing system in the local environment can provide a number of advantages for example: minimize cost incurred in production and services. One way to do it is by eliminating waste in the production process, and focus on the processes that has added value for customers, decreasing storage cost, decreasing work force, increase the number of qualified expert, and well trained personal, plus developing



effective programs. All these advantage will directly and indirectly affect the restructuring and reorganizing of the industrial sector. Also, the adoption of this system would affect the cost improvements in Libya which, in turn will affect other sectors.

It is believed that the manufacturing industries in Libya needs a modernization process that will upgrade the level of its local industrial Companies, and allow them to achieve the highest possible level to compete globally. Currently there are very few studies in this field and therefore a complete analysis of the manufacturing industries in Libya is lacking. Given that the current economic climate has changed, it is now an ideal time to implement lean manufacturing which were once prevented. It's time to bring in new ideas to improve all sectors throughout Libya.

This paper tries to illustrate how to solve the implementation of lean manufacturing problem in the Libyan manufacturing industries using Quantitative technique analysis by using Structural Equation Modeling (SEM) techniques. SEM is a statistical method to use as when the hypothesis testing approach is used to analyze a structural theory which bearing on some phenomenon. Also to help the academicians and industrial practitioners to have better understanding on the relationship between the Lean Manufacturing practices and business performance especially related to Libyan manufacturing industries.

PROPOSED CONCEPTUAL FRAMEWORK

Figure-1 shows the proposed conceptual framework which consists of four variables: (1) Lean Manufacturing, (2) Process Improvement, (3) People Development, and (4) Business Performance.

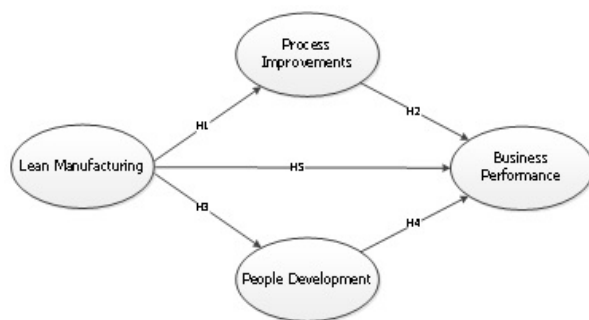


Figure-1. Proposed conceptual model.

Lean manufacturing

In general, Lean Manufacturing (LM) is an arrangement of techniques and activities for running a production industries or service operation. The fundamental of "lean thinking" is that every business processes and functions must implement lean principles and tools to reach a better performance by eliminating "waste". As stated by Antony, (Antony, Agus, & Shukri Hajinoor, 2012) the waste itself are divided into 8 categories such as categories: overproduction, motion,

inventory, defects, waiting, transportation, extra processing, and underutilized people.

There are many techniques of Lean Manufacturing which may vary among companies and countries, however, the author seek for such technique which suited to the research, as according to (Fullerton, Kennedy, & WidenerbaJon, 2014) and (Büyüközkan, Kayakutlu, & Karakadılar, 2015) there are several techniques in Lean manufacturing such as Process Flow Improvements, Employee Improvements, Setup Time Reductions, and reduce buffer inventories. These strategies can be used in order to achieve a good business performance.

Process improvement

Many companies have implemented process improvement and as the result it leads to significant improvements in operational areas. Process improvement is a construct that captures the level of Continuous Improvement activities as reflected by the level of Kaizen activities, long-term focus and tackling problems at the source (Jayamaha, Wagner, Grigg, Campbell-Allen, & Harvie, 2014). Without good process improvements, the production process will have difficulties which will impact business performance and goal.

Process improvement is to evaluate alternative ideas and transform the organization into something new or different. The objectives of process improvements are to eliminate errors, maximize the use of assets, minimize waiting time, provide understanding and ease of use, ability to adopt customer's wishes, giving companies a competitive advantages and reduce cost. Information to make process improvements are available from existing processes, their pain points, obstacles and resource availability, and also from best practice models. (Salleh, Kasolang, & Jaffar, 2012) stated that Process Improvement could be measured with time saving, productivity, process time, cycle time, production rate and utilization.

People development

People are critical factors as for maintaining the success of production compared with technology. People Development or Employee Development has become something that plays an important role apart from careers and work lives, by supporting and implementing employee development it may raise positive outcomes for the organization. Every improvement or changes made in organization there must be aligned with people development, meaning that organizations must develop those people or employee to be able to follow the changes. People development is costly, but the organization must look for a solution with the best approaches that can be done. One way to streamline the budget for the development is to analyze the job description of each job, define KPI of any position, and concluded that the minimum requirement needed to carry out the task. In that given point we begin to start prioritizing development programs that can be conducted in accordance with the



budget. People must be treated humanely in order to obtain positive Culture in the organization. People Developments could be measured by Prior Participation, Learning Qualities, Learning Goals, Prove Goals, Perceived Need and Work Support (Maurer & Chapman, 2013).

Business performance

Business performance or Firm performance usually used to capture the long term behavior of the organization. Business performance considering the organizational responsibilities towards their shareholders and the main objective is profit maximization, (Ahmad, Ariff, Zakuan, Takala, & Jusoh, 2013) stated the real challenge of industry is on how to improve their performance particularly in quality, productivity and cost in competing in global market. From previous research by (Fullerton *et al.*, 2014) stated that here are positive relationship between lean techniques implementation and business performance, different conditions may give different results caused by the effect of circumstantial factors. (Dowlatshahi & Cao, 2006) divided Business Performance measurement into two categories, first market performance, which consists of market share, sales growth and revenue growth, the second is financial performance, such as return on investment, return on sales, liquidity, cash flow and profitability.

Table-1. Variable's factors.

No	Variables	Factors
1	Lean Manufacturing (Fullerton <i>et al.</i> , 2014)	Process Flow Improvement
		Employee Improvements
		Setup Time Reductions
		Reduce Buffer Inventories
2	Process Improvements (Mohd. Salleh <i>et al.</i> 2012)	Time Saving
		Productivity
		Process Time
		Cycle Time
		Production Rate
		Utilization
3	People Developments Maurer & Chapman, 2013)	Prior Participation
		Learning Qualities
		Learning Goals
		Prove Goals
		Perceive Need
4	Business Performance (Dowlatshahi and Cao, 2006)	Work Support
		Market Performance
		Financial Performance

HYPOTHESIS

Based on Figure-1 of the Proposed Conceptual Framework, the following hypotheses were formulated by the author for each linkage. Each of the constructs represents one of the five propositions identified in the preceding discussions.

H1. Lean Manufacturing has significant impact on Process Improvements.

H2. Process Improvements has significant impact on Business Performance.

H3. Lean Manufacturing has significant impact on People Development.

H4. People Development has significant impact on Business Performance.

H5. Lean Manufacturing and Business Performance.

H6. lean manufacturing, Process Improvements, People Development and Business Performance has a significant interaction in the structural model.

H1. Lean manufacturing has significant impact on process improvements

In order to implement Lean manufacturing in the industries, the need of changes will be available, this change will affect all process in the company specially in the production process, in order for companies to adopt those changes and it needs, improvement of existing processes, this will also help people to do the right thing properly, and company will reduce cost from failure and reduce production time.

Every process in production must be standardized, documented and socialized to every employee so that they will follow the given instructions, this applies to new and existing employees, by doing so production will be stabilized, and it may reduce waste. Previous research stated that by implementing process improvement method, it will provide managers with a detailed understanding and provides visual aids in designing, production process to improve human performance and procedural improvement (Hussain, Stewart, Rivers, & Munchus, 2015).

H2. Process improvements has significant impact on business performance

In most organization's activities the main goal is to reduce the tangible cost such as raw material, labor cost, etc. But there are also intangible cost occurred, such as invoicing, ordering, and scheduling. They tend to focus on tangible costs as an improvement target, and ignoring the intangible cost. In fact, if we ignore the intangible cost it will have the opportunity to improve the organization's bottom line significantly. By expanding the standpoint of process improvement, manufacturing companies will be able to find the best ways to improve their business performance. By doing proper process improvement the organization will reduce more cost in the production process, avoid mistakes or error, minimize production time and will produce a better quality of products. (Münstermann, Eckhardt, & Weitzel, 2010) stated that process standardization leads to Process time, process cost and process quality.

H3. Lean manufacturing has significant impact on people development

The success of lean implementation depends on well-trained employees. Lack of people development will impact on operational process of the organization. People must have motivation, skill, integrity, and professionalism



in order to have a successful lean implementation. In a lean production environment, Training is important in the lean production industry since it helps to develop a workforce which is capable of accepting more responsibilities.

Management should aware about people development in order to successfully implement Lean manufacturing in the organization. As stated by (Nordin *et al.*, 2012) the redness can be addressed by identifying and understanding the Need for Change, having a clear and consistent Leadership and Direction, and creating a strong Change Agent Team. The next step that the organization should do is to take up and implement the lean tools and techniques. The purpose is to develop multi-skilled workers, and to create an environment in the organization where workers have the skills and ability (Wahab, Mukhtar, & Sulaiman, 2013).

H4. People development has significant impact on business performance

Effectively managed human resource (HR) is a critical process for enhancing and developing a firm's capabilities, which in turn affects the performance of the firm (Orr, Bush, & Vorhies, 2011). In the era globalization, competition is becoming something that is important to get attention. Companies that reluctant to compete will be abandoned and left behind. Factors of production in Industries are resources, capital and technology, which modified to be able to meet the organization's goal. But in the process it is undeniable that the main driver for the successful companies is human resources. Therefore, people development play an important role in achieving the company's goal, such as increasing business performance.

H.5. Lean manufacturing has a significant influence on business performance

All strategy in manufacturing industries is to achieve goals, where the main goal is to please the shareholder to maximize profits by reducing cost. The efforts to achieve competitive advantage in delivering superior value to consumers can be done through the improvement by eliminating activities that do not provide added value. As stated above Lean Manufacturing may help organizations to reduce "waste" which related to cost efficiency. By successful implementation of lean manufacturing, it will benefit the company which will be reflected in Business Performance.

Lean Manufacturing was introduced by Toyota management. Philosophically, most of improvements in Japan were built on this principle, for example the art of bonsai, this is the art of engineering a plant, reduce space, but still looks beautiful. Lean manufacturing also recognized as a powerful strategy for improvement in business performance (Antony *et al.*, 2012).

RESEARCH METHODOLOGY

Based on theoretical framework (Figure-1), it consists of one independent variable such as Lean

Manufacturing, are dependent variable as Business Performance and two mediating variables which are people development and process improvements. The independent variable and mediating variables hypothesized to have direct impact on independent variables. The study classified as descriptive and explanatory research, as to confirm to hypothesize the relationship between two or more variables.

Structural Equation Modeling (SEM) techniques. SEM is a statistical method is to be used as confirmatory when the hypothesis testing approach to analyze a structural theory which bearing on some phenomenon. This structural theory is suitable for 'causal' processes that generate observation on multiple variables. It has two aspects to be considered, first the causal process which still under study and represented by a series of structural equation, and secondly, that these relations can be modeled in order picture more clearer of conceptual theory. The model could be tested statistically for entire variables to determine the success of the theory, whether it maybe fits adequately which mean have a positive relations among variables or maybe not fit which will cause the rejection of the theory (Byrne, 2013).

There are three characteristics of SEM model, firstly estimation of multiple and interrelated dependence relationships, secondly an ability to represent unobserved concepts in these relationships and account for the measurement error in the estimation process, and thirdly defining a model to explain the entire set of relationships (Hair, Black, Babin, Anderson, & Tatham, 2006).

This study is a 'latent variable' study, where it may not be observed or measured directly. By using the SEM model, the author may assess the success of the relationship in each variable and measure the combinations. SEM provides a conceptually appealing way to test theory where the researcher can express the theory in terms of relationships among measured variables and latent constructs (variants), and then SEM will assess how well the theory fits as represented by the data (Byrne, 2013).

According to (Hair *et al.*, 2006), the six stages in SEM are:

1. Defining individual constructs
2. Developing a measurement model.
3. Designing a study to produce empirical results
4. Assessing the measurement model validity
5. Specifying the structural model
6. Assessing the structural model validity

Samples and sampling

Libyan Industries who implementing Lean Manufacturing where the main respondent. The organization has been from various industries such as steel, oil, cement, healthcare, etc. A questionnaire will be distributed to all correspondents that contained measures of the variables concern. The questionnaires will be distributed to the respondents by using simple random sampling method. As such, the response rate for this study will be analyzed by SEM.



Scaling

The scaling to be used in this research is the 7-point Likert scale of 1-strongly disagree, 2-disagree, 3-slightly disagree, 4-neutral, 5- slightly agree, 6-agree and 7-strongly agree. The demographic variables asked are gender, age, education and the position of the respondent.

CONCLUSIONS

This paper presents a proposed conceptual model of the relationship between lean manufacturing practice and business performance in the Libyan manufacturing industries. Lean manufacturing is an independent variable and business performance is the dependent variable. The mediating variables include Process Improvement factor and People Development factor. There are many tools of lean manufacturing that can be used in Libyan industries to achieve Business Performance.

The hypotheses of the study are Lean Manufacturing has significant impact on Process Improvements, Lean Manufacturing has significant impact on People Development, and People Development has significant impact on Business Performance and the Lean Manufacturing has a significant influence on Business Performance. The contribution of the study would be the methods and techniques to determine the degree of implement lean manufacturing principles and then examining the link between lean manufacturing and business Performance.

The proposed conceptual model would help the academicians and industrial practitioners to have better understanding on the relationship between the Lean Manufacturing practices and business performance especially related to Libyan manufacturing industries.

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