A Review on Investigation and Implementation of Lean Manufacturing in a Small Scale Industry for Effective Productivity

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Abstract

Lean manufacturing which is also known as lean production has been one of the most popular paradigms in waste elimination in the manufacturing and service industry. Thus, many firms have grabbed the benefits to practice lean manufacturing in order to enhance quality and productivity. However, previous research shows that, there are various sets of tools or techniques that had been adopted at a certain degree across firms according to their own understanding of lean manufacturing. The scenario resulted with varying leanness measures in order to measure lean practices. This project describes a preliminary study in developing a conceptual model to measure leanness in manufacturing industry. Literature survey, books and report analysis contribute to the main preliminary analysis of this study. The most common tools or techniques and their usefulness have been investigated. In this research, a conceptual model for leanness measurement in the manufacturing industry has been developed and designed in two main levels, namely the dimensions and the factors. There are seven main dimensions in measuring leanness in lean manufacturing practices such as manufacturing process and equipment, manufacturing planning and scheduling, visual information system, Supplier relationship, customer relationship, workforce and product development & technology. In addition, the model also shows how lean dimensions in the manufacturing system relate to eight types of wastes.

Keywords: Lean tools, Productivity, Waste elimination, Planning and Scheduling

I. INTRODUCTION

Manufacturing firms operating in rapidly changing and highly competitive markets have embraced the continuous process improvement mind set. They have worked to improve quality, flexibility and customer response time using the principles of Lean thinking. To reach its potential, lean must be adopted as a holistic business strategy, rather than an activity isolated in operations. The lean enterprise calls for the integration of lean practices across operations and other business functions. As a critical component for achieving financial control, management accounting practices (MAP) need to be adjusted to meet the demands and objectives of lean organizations. Our aim is to help both researchers and practitioners better understand how lean MAP can support operations personnel with their internal decision making, operations executives and business leaders in their objective of increasing lean operations performance as part of a holistic lean enterprise strategy. One can document that, the extent of lean manufacturing implementation is associated with the use of lean MAP, and further that, the lean MAP are related in a systematic way: simplified and strategically aligned MAP positively influences the use of value stream costing, which in turn positively influences the use of visual performance measures. One can also find that, the extent of lean manufacturing practices is directly related to operations performance. More importantly, lean manufacturing practices also indirectly affect operations performance through lean MAP. These findings are consistent with the notion that, lean thinking is a holistic business strategy.

II. LITERATURE REVIEW

Lean manufacturing has been the buzzword in the area of manufacturing for past few years especially in Japan. The Kanban system is one of the manufacturing strategies for lean production with minimal inventory and reduced costs. However, the Kanban system is not being implemented widely by manufacturing companies in Malaysia. Thus, the objectives of this case study are 1) to determine how does the Kanban system works effectively in multinational organization; and 2) to identify factors hindering Malaysian small and medium enterprises (SME) from implementing Kanban. Findings of the study suggest that top management commitment, vendor participation, inventory management and quality improvement are important for Kanban

deployment and towards lean manufacturing (Nor Azian Abdul Rahman, 2013). The ideas of Group Technology and Cellular Manufacturing have been a research topic for decades. Although widely implemented in assembly, the principles of flow production as central element of Lean Production have not often been transferred successfully to machining areas yet. In times of continuously rising hardware complexity Cellular Manufacturing is an alternative approach to enable both, flow production and volume flexibility in machining, but can rarely be found in Europe. Current research activities focus on identifying relevant performance indicators to evaluate economic fields of application of Cellular Manufacturing using the example of milling (Joachim Metternich, 2013).

More and more companies are interested in the well-being and satisfaction of human resources. Nowadays, long term objectives are more important and advantageous for any company, especially for their employees. On the one hand, in order to have a productive and accomplished vision and future, every organization should continuously develop and adapt to new demands and offers. On the other hand, dealing with the right direction of performance implies many changes, unexpected problems, misunderstandings and slow steps. The lean manufacturing system is complex and benefic but the possible changes can bring ergonomical issues. The nature of the problems is often felt by the human resources, the most important element in an organization. This paper will present a qualitative briefing and review in order to understand the evolution of lean implication. The literature overview will point out the ergonomical issues that occur after the lean acceptance. This assessment is helped by five solid scientific materials, from different domains, which conclude in the end the authors' presumption (Bianca Cirjaliu, 2016). Cellular Manufacturing has been proven to be an economic, efficient and lean approach bringing flexibility into machining areas. Corresponding solutions use several basic machines that are adapted to the machining task in a right-sized equipment approach. However, the use of basic, low cost machinery providing just necessary functions results in a relatively high manual operation effort. The preferred approach in order to reduce manual work in production is automation. Traditional automation of man-machine systems – especially in western countries – tends to be comprehensive and thus often complex and expensive. A low cost, lean automation intelligently being adapted to the individual task, as well as a decision method for choosing the tasks worth being automated, is required. The first step on the road towards a scientifically sound low cost automation method for a Cellular Manufacturing line is identifying and quantifying the different manual tasks which could potentially be automated. Therefore, this paper starts with investigating existing analytical methods for measuring work. The different measuring concepts have been applied to the Cellular Manufacturing reference line at the Process Learning Factory CiP at TU Darmstadt. An adequate evaluation system considering reality, detail, and variation and effort levels has been defined in order to assess the results' suitability for evaluating manual work in a Cellular Manufacturing line, pointing out potentials and limits of the individual approaches. As the final outcome, a ranking of different work measurement concepts for the Cellular Manufacturing reference line is presented, verifying the applicability of the general approach and serving as a basis for further evaluation of other lines (Stefan Seifermann, 2014).

The overall performance of a manufacturing organization is a drastic function of the strategies applied to its physical sectors. Traditional strategies were based on the principle of economies of scale, which resulted in excess of waste and difficulty of reconfiguration. Global competition necessitates formulating efficient and effective paradigms in response to the global economies to improve the overall performance. Lean and agile manufacturing have been widely adopted in recent years' enterprises. Leanness mainly leads to eliminating the non-value added activities while agility focuses on leads to market responsiveness. This paper discusses the leanness and agility definitions, factors, paradigms, differences, and combination. A hierarchic framework is presented which can be used to measure the leanness, agility, leagility, and overall performance of an enterprise, further, to compare different enterprises. This enables using the multi-criteria decision making methods especially AHP and ANP. Levels of leanness and agility can be fed as input to define a variety of enterprises. Moreover, a different view is introduced for general features of an efficient/effective manufacturing organization irrespective to the definitions of leanness and agility (Hassan Soltan, 2015). Value stream mapping (VSM) is a useful tool for describing the manufacturing state, especially for distinguishing between those activities that add value and those that do not. It can help in eliminating non-value activities and reducing the work in process (WIP) and thereby increase the service level. This research follows the guidelines for designing future state VSM. These guidelines consist of five factors which can be changed simply, without any investment. These five factors are (1) production unit; (2) pacemaker process; (3) number of batches; (4) production sequence; and (5) supermarket size. The five factors are applied to a fishing net manufacturing system. Using experimental design and a simulation optimizing tool, the five factors are optimized. The results show that the future state maps can increase service level and reduce WIP by at least 29.41% and 33.92% respectively. For the present study, the lean principles are innovatively adopted in solving a fishing net manufacturing system which is not a well addressed problem in literature. In light of the promising empirical results, the proposed methodologies are also readily applicable to similar industries (Taho Yang, 2015).

Identifying the most efficient supply system for a company working under Lean Manufacturing practices was possible with the support of this work. Promodel software was used to develop simulation model depicting a constant velocity joints (CVJ) production system, where two different supply methods were assessed. According to results herein obtained, better performance is achieved under random supply method in comparison with a clustering supply method. The company's goal is to keep 1% losses due to lack of material. In the actual process, this essential parameter was reduced from 2.73% to 1.177%, if random supply method is properly implemented (J. A. Jiménez-García, 2015). Lean Manufacturing (LM) is a business strategy that was developed in Japan. The main role of lean manufacturing is to determine as well as to eliminate the waste. Companies implement LM to keep their competitiveness over their competitors by improving the manufacturing system's productivity and quality enhancement of the product. The goal of this paper is to apply one of the most significant lean manufacturing techniques called

Value Stream Mapping (VSM) to improve the production line of a color industry as a case of study. To achieve this goal, lean fundamental principles was implemented to construct VSM for identification and elimination of wastes by using team formation, product selection, conceptual design, and time-frame formulation through the time calculation. Based on the future VSM, final results showed that by implementing some lean thinking techniques, Production Lead-time (PLT) decreased from 8.5 days to 6 days, and the value added time decreased from 68 minutes to 37 minutes (Jafri Mohd Rohani, 2015).

This study investigates the unique and complementary effects of manufacturing technologies and lean practices on operational performance of manufacturing firms. Despite the importance of understanding how various resources are interrelated within firms, there have been few studies focusing on this area. Using data collected from 186 manufacturing plants in Thailand, we found that both manufacturing technologies and lean practices have unique effects on a range of operational performance dimensions, including quality, lead-time, flexibility, and cost. More importantly, however, we also found that both organizational resources have complementary (or synergistic) effects on those operational performance dimensions. Based on the research findings, we offer theoretical and practical insights which support the importance of building strong manufacturing technologies and lean practices that maximize operational performance (Teerasak Khanchanapong, 2014). The aim of this paper is to explore and evaluate previous work focusing on the relationship and links between Lean and sustainable manufacturing. Several frameworks are explored and discussed. Their relationships include correlation, overlapping area, difference, integration and classification based on sustainability dimensions. This paper also examines impact of lean and sustainable manufacturing to improve performance. Many evidences suggested that Lean is beneficial for Sustainable manufacturing, dominantly on perspective environment and economic aspect. This paper identifies major research gaps for integrated lean and sustainable manufacturing to improve performance business and modeling as a methodology approach. To do of 58 key research papers have been reviewed for the research contribution, methodologies, country of research, and date of publication. This paper provides a quantitative descriptive analysis and qualitative thematic analysis to provide an analysis of relationship lean and sustainable manufacturing and its impact on performance (Sri Hartini, 2015).

III. CONCLUSION

Lean concept focuses on eliminating non value-added activities while agile detecting and responding to uncertain changes of the market. Challenges for competing in the business environment makes lean and agile as vital capabilities of a manufacturing organization. Both concepts are able to achieve strategic objectives (competitiveness, productivity, profitability, and survival) through improving the overall performance. Many researchers suggest that, combining lean and agile via decoupling point increases the organization benefits. This paper redefines lean and agile, and describes a comprehensive methodology for performance analysis at enterprise level based on both concepts. Including, a hierarchic framework is built to encapsulate the factors that affect the organizational performance. Then, another terminology is introduced, healthy enterprise, which simplifies the application of such proposal. Therefore, we can accumulate the practices of lean and agile in a practice list for the healthy enterprise. However, the success of an enterprise depends on understanding the real business environment particularly the threats that may face the organization. Finally, the authors suggest four points for future research. First best location and multiplicity of the decoupling point for leagile. Second, introducing overall cost and benefit functions to measure the impact of migration to lean and/or agile. Third, possibility of identifying a general term as proposed in this paper. Fourth is of applying the proposed methodology to different manufacturing organizations.

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