Lean Manufacturing Initiatives

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LEAN MANUFACTURING INITIATIVES: ARE SMALL & MEDIUM ENTERPRISES MISSING OUT?

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Abstract
The purpose of this research study is to analyze the factors that prevent small and medium size enterprises from implementing lean manufacturing processes and show, that by not implementing lean they are missing out on savings, efficient workforce, and new markets in the globalization arena. Globalization offers opportunities that have not been realized by SME’s yet still pose challenges and barriers that can be overcome by adoption and implementation of lean manufacturing.

Introduction
Lean manufacturing (LM) was inspired by the Toyota Production System (TPS) which has been focused on elimination of waste and improving customer satisfaction. LM is a set of principles, philosophies, and business processes which enable the implementation of it, which has been widely known and implemented since 1960.

Yet lean manufacturing practices among SME’s have been virtually ignored, yet if they are implemented, it’s on a piece meal basis which produces ineffective results. Shah & Ward, (2003) argued that lean manufacturing is a proven method of increasing productivity. While large companies seem to have embraced manufacturing philosophies such as Lean and Six Sigma, empirical evidence suggests this is not the case for SMEs. Von Axelson, (2009) postulates that Lean knowledge is mainly tied up in large manufacturers and has not widely spread among SMEs.

In trying to understand why SME’s have such a difficult time in initiating and implementing lean manufacturing process research suggest that time, money, resources, and centralized management systems could be critical factors. Citing factors; of resources, management, and organization. SMEs have clearly less resources, both in time and money. Their management style tends to be short-term oriented (Antony et al, 2005) without much strategic alignment and performance follow-up (Smart et al, 2004). However the management team is usually small and centralized, multi disciplinary ‘hands-on’, informal and people oriented (Ghobadian et al, 1996). If SME’s are going to incorporate lean into their present system, why not look at the best model Toyota’s TPS system which serves as the epitome of lean in the manufacturing environment, nonetheless SME’s don’t have the budget or resources of Toyota yet with sound management principles and strategic thinking it’s an achievement worth the effort.

Literature Review
The implementation of lean manufacturing poses many challenges for many small and medium size enterprises (SME’$). Safayeni et al. (1991) accentuate the difficulties and controversies in implementing one of the many lean manufacturing techniques known as just-in-time. Baker (1996) and Iyer and Jha (2004) accede with Safayeni in that this problem may further be compounded by a lack of standardized mechanism of analysis and measure of value-adding capabilities within organizations, such as the lean
In conjunction with standardization critical factors such as leadership, funding, resources of employee skills and knowledge contribute to successful implementation of lean manufacturing. Achanga (2004 and 2005) Hayes (2000) articulates that successful corporate initiatives like lean manufacturing should be properly planned prior to implementation. Antony and Banuelas (2001); Coronado and Antony (2002); Eckes (2000); Henderson and Evans (2000) postulate that management involvement and commitment are perhaps the most essential prerequisites in adding any of the desired productivity improvement initiatives. Other authors have stressed leadership as the dominant factor while other have echoed the need for developing close relationships with suppliers, value chain mapping, customer behavior change along with supplier behavior change as factors to implementing a successful lean manufacturing process. Golicic & Medland (2011) argue that the successful implementation of lean requires practical and behavioral changes for the participants – both internal and external to the company. This argument is exemplified by Brown and Inman (1993) stating that the lack of power restricts small firms from achieving an equitable position with an external linkage.

Lean manufacturing has been discussed extensively in the last decade, yet little empirical evidence suggest that SME’s are better off without it or that they can’t overcome the barriers to full implementation of lean. With most research focusing on implementation of lean manufacturing in large companies, competition in the global market and lean in the supply chain management there is very little literature about lean and SME’s. Rose et al. (2011) cite that it was noticed that LM has been implemented successfully in large organizations but there is still few documented evidence of its implementation in smaller organizations.

Gaps in the Literature

Although research has been done in lean manufacturing among large corporations and some among SME’s focusing on globalization and competitiveness, only an exiguous amount of research has been done relating to software of lean manufacturing. Staats and Upton (2009) cite the lack of research in this area. “While the concepts of lean production are frequently applied in service organizations there is little work that rigorously has examined implementing lean production in contexts other than manufacturing as well as lean production’s impact on performance in these settings.”

Research Problem

It has been found that large companies enjoy cost savings, reduced inventory, efficiency, and skills improvement among employees and competitive advantages that their smaller counterparts do not through lean manufacturing. SME’s through research cite such barriers as cost, leadership among other things that prevent them from implementing lean manufacturing. This research explores those factors and examines how SME’s are missing out on critical benefits which can alter their competitive advantage in the global market.

History and Origins of Lean

The origins of lean can be found at Toyota where the Toyota Production System (TPS) was developed over time as an alternative to the methods of mass production which could be observed in the Western countries during the 1950ies. At that time, western manufacturers focused on mass production with high volumes due to the demand situation after the war and the rebuilding of the economies. Mass production
had a number of advantages such as efficient processes generating low cost products and high volumes, but it also represented a number of disadvantages such as limited consumer choice and limitations in the quality of work life for employees. As the demand situation stabilized, pressure grew to deal with these negative aspects of mass production (Bowen and Youngdahl, 1998). In Japan, Taiichi Ohno of the Toyota Motor Corporation set about implementing the efficient mass production methods he had observed during a visit to the US. Some major obstacles to the endeavor were the low volumes in the Japanese market and scarcity of capital following the Second World War (Holweg, 2007). In the 1980s, research conducted by MIT provided data for the world renowned book The Machine That Changed The World (Womack et al., 1990) as well as several papers, such as the one by Krafcik (1988) where the term lean was coined. The current understanding of lean builds to a great extent on the observations and the analysis of that research study;

**Lean among SME’s**

According to the U.S. International Trade Commission within the U.S. economy, SMEs account for the vast majority of firms and approximately half the gross domestic product (GDP) generated by non-agricultural sectors. However, SMEs accounted for only about 30 percent of merchandise exports between 1997 and 2007. It can be concluded that many SMEs are missing out on important potential benefits of cost reductions, increased productivity and operational agility. For SMEs especially, supply chain management practices and techniques become critical enablers of competitiveness. Supply chain coordination and integration depend to a large extent on information flows between suppliers and customers. Owing to low resource levels and high costs of capital, SMEs tend not to invest in sophisticated supply chain integrating applications such as enterprise resource planning (ERP) software packages (Koh and Simpson, 2005).

**Obstacles to Lean for SME’s**

Holm (2010) cites and argues that in lean literature today, there are numerous single case studies which offer anecdotal evidence of the potential of adopting lean (McQuade, 2008; Swank, 2003) but at the same time, previous studies have shown that many attempts to integrate lean in manufacturing businesses fail (Bodek, 2008; Robinson and Schroeder, 2009). Top management commitment is often mentioned in lean literature as a major reason for why come companies fail in implementing lean, and as a prerequisite for implementation success (Suárez-Barraza and Ramis-Pujol, 2010). Leadership and related issues are mentioned as enablers or inhibitors of lean implementation success in almost every academic (and practitioner) paper published in the field (Radnor, 2010; Suárez-Barraza and Ramis-Pujol, 2010). At the same time, there are indications to suggest that some lean implementation efforts fail even with top management commitment (Sim and Rogers, 2009).

With so much emphasis placed on management’s commitment to lean policies being established and used as a measure of whether those lean policies succeed or fail, yet with management’s full support you still have companies who fail in implementing lean programs. Holm (2010) argues if this is really the case, then this forces the question of whether leadership commitment as such is not enough to ensure success in implementing lean. Could there be one type of leadership which is more suited for lean operations than others? Although Holm discusses certain leadership styles are suitable for lean among SME’s. Ettkin et al. (1990) found in a survey of small manufacturers that approximately one third of the respondents indicated they had lean-type management programs. The most common aspect of lean being adopted was employee involvement programs. Ettkin et al also found, however that most small firms did not actually
understand what lean management was, and that while they claimed that they were lean, they often did not adopt some of the major components of a lean management system.

Other factors that affect the implementation of lean practices among SME’s according to researchers are lack of top management commitment, limited financial resources, investment in specialized equipment, and a lack of perception that lean production is a simpler form of manufacturing control (Bowen & Inman, 1990).

**Implementing Lean in SME’s**

Implementation of any new design or model has to have a foundation to provide a framework for managers of companies to not only understand, but to establish a method of how the new concepts will be implemented. There are factors that influence the success of lean models and concepts. Pius et al. (2006) perspective and in agreement with Holm (2010) argues that Thus, in order to succinctly implement the concept of lean manufacturing successfully within SMEs, the recipient companies should harbor strong leadership traits capable of exhibiting excellent project management styles. In essence, these qualities would facilitate the integration of all infrastructures within an organization, since strong leadership and management permeates a vision and strategy for generating, while permitting a flexible organizational structure. Good leadership ultimately fosters effective skills and knowledge enhancement amongst its workforce.

When implementing a lean process to an organization, identification of has waste is the first step. Wanitwattanakosol and Sopadang (2010) postulate that in order to accomplish the goals of lean manufacturing many tools have developed. One of the key lean tools is that of “Value Stream Mapping (VSM).” This tool when used to create a map of both value and waste in a given process. Value stream gives an organization an overall view of where waste occurs, and what processes are of value and should be retained but in a more efficient manner.

1. Value Stream Mapping

Value stream mapping is a process of creating a picture of the process that occurs in any given organization, from the time a customer places an order for a product to the time of delivery of that product in their facility. The main objective a value stream map is to depict how material and information flows across and throughout all value-adding processes required to produce and ship the product to the customer.

A typical Value Stream Map: See Figure 3

**Figure 3**
2. Lean Is a Process

When developing a lean manufacturing system it can be said that it is a strategic journey that doesn’t happen overnight, it has to be continuous with commitment. Anvari et al. (2011) conceptualize that there are no clear-cut guidelines as to how systems should be implemented in every specific case; rather, the implementation should take into account the individuality and the special requirements of each production system (Standard and Davis, 1999; Lathin and Mitchell, 2001). Karlson and Ahlstrom (1996) emphasize that the important point to note is that “lean” should be seen as a direction rather than as a state to be reached after a certain time. Shingo (1989) recommends a model in a ‘Gantt chart’ format in which key elements of “lean” can be implemented during one year. Shingo schedules 15 items, elements, tools and techniques (for example initial survey, single minute exchange of dies (SMED), creating suitable space, poke yoke, leveling, Kanban, etc.) for “lean” implementation in a year. He believes that to provide rapid responsibility you should create suitable space for educating managers, reducing setup times, improvement of layout on shop floor, setup time elimination, leveling production, and one-piece flow.

Alam et al., (2010). Kowalski (1996) suggests a 10-step Ford model: Plants improvement, development of effective teams, standard work, decreasing layout time, focus on maintenance, preventive operations for development of confidence, leveling production, JIT (pull system),

3. Value Stream Map

minimizing inventory, and decreasing costs. He focuses on the development of effective working systems and standardization of work. Beck (1999) proposes an integrated model of a production system based on 10 steps: Informing production and assembly unit, reducing or elimination of alignment, providing integrated quality control, applying integrated PM, leveling and balancing production, Kanban, reducing setup time, sale planning, automation, and computerizing the systems.

Brown and Inman (1993) state that the successful implementation of lean requires modifications to the participants’ operations – participants both internal and external to the company. Lee (1996) presents a list of keys to successful lean and JIT practice implementation for SME. Among these keys are the necessity for communication with customers and suppliers when implementing lean. It has been recently suggested that the focus of lean needs to move beyond the firm to the supply chain in order for companies to realize full benefits (Bhasin and Burcher 2006). Lean manufacturing is a systems approach, much like logistics and other supply chain management processes.

Golicic & Medland (2011) postulate that many SME in supply chains are vulnerable and have little power compared to customers and suppliers (Achanga et al. 2006). Lee (1996) agrees that SME lack negotiating or bargaining power when dealing with customers and suppliers and states they are at a disadvantage when developing relationships with customers and suppliers. Hallikas, Virolainen, and Tuominen (2002) studied the influence on SME by larger customers through a case study of dyadic relationships. They found evidence that smaller companies did not have the resources for deeper cooperation, and therefore experienced higher levels of dependency and transaction costs.

Golicic & Medland (2011) argue that the successful implementation of lean requires practical and behavioral changes for the participants – both internal and external to the company. This argument is exemplified by Brown and Inman (1993) stating that the lack of power small firms from achieving an equitable position with an external linkage. The graph below illustrates Golicic & Medland case argument.
In looking at the graph from in the hierarchy form of bottom to top we can see how if we change the behavior of the suppliers and customers this change will determine the success or failure of lean implementation in a SME. See Figure 4.

**Figure 4.**

![Graph depicting the hierarchy form of bottom to top](image)

**Porter Five Forces: Figure 5.**

![Porter Five Forces diagram](image)

**Factors That Influence Lean Implementation**

There are a number of factors which determines the implementation as well as the success of lean processes in a SME. Porter’s model from figure 5 revolves around competition, with the threat of new entrants, buyers, substitutes and suppliers bargaining power influencing whether a company changes its processes to meet these threats and being a factor in the implementation of a successful lean program.

Achanga et al. (2005) identified four factors that are critical to the successful implementation of lean, finance, leadership, organizational culture and skill and expertise. Figure 6 shows the pattern.
Benefits of Lean for SME’s

There are a number of benefits SME’s can gain from implementing full lean programs. Stamm and Golhar (1990) found that small firms are able to achieve many of the benefits of lean that are enjoyed by larger firms. The benefits include smaller inventories, improved quality, shorter lead times, reduced waste, and lower costs. Winston & Heiko, (1990), Brown & Inman (1993) articulate that some research suggests that SME’s may actually have more immediate success in starting lean manufacturing practices than larger firms. Smaller firms are often more flexible, have a greater amount of general purpose equipment, have a greater number of multifunctional workers, and have a management staff that is closer to operations and production.

Sanchez and Perez, (2001) argued that lean production increase competitiveness of company. Alukal and Manons (2002), states that a planned implementation of lean production system leads to improved quality, better cash flow, increased sales, better productivity, improved morale and higher profits. They further reported that companies earned greater benefits by implementing lean techniques in the office functions in non-manufacturing organizations too, such as banks, hospitals, restaurants etc.

Conclusion

Lean manufacturing is beneficial for SME’s as is for large corporations it reduces, waste, reduces inventory levels, and adds to the competitiveness of the company in national and global markets. Companies adopt lean processes for various reasons whether it’s to streamline cost or to gain entry into new markets; hence it is in the best interest for SME’s to implement full lean programs than to use parts of lean and to ensure a successful lean program.

Further Research

This study indicates that there is a need for further research and that this study is inclusive and represents a small sample of research done in the field. It would be beneficial for a more complete study analyzing what benefits have been derived from implementing lean manufacturing processes among large companies and SME’s and how have those benefits translated to cost savings, supplier relationships, performance, quality and competitiveness.
References


