Chapter 2
Literature Review

2.1 Overview

Reviewing the existing literature provides an initial starting point in defining lean manufacturing practice adopted by various industries. Additionally, it also helps us to highlight the confusion in the conceptual success factors and the operational issues around lean practice and gather a set of lean operational measures that can be used to represent the performance of any organization. In conducting the review process, we began with the earliest publications related to Japanese manufacturing/production systems ending with the most recent publications related to lean practice. We observed that, in general, the early Japanese books were more precise in defining Lean and in identifying its underlying components (Monden, 1983) compared to the research articles because the latter focused on defining and describing specific components of the system rather than the whole. Small and medium enterprises provide the majority of production to OEM and the same amplifications in the other sector. Therefore, business scenarios and challenges for OEM oppress them. OEMs are now forcing their suppliers to continuously improve product quality and the implementation of lean methods and tools. This has created new perspectives and pressure for the production in different small and medium-sized enterprises. Many quality concepts and tools are available and are used for quality improvements, such as lean manufacturing, six sigma, and lean six sigma etc.

2.2 Lean Manufacturing

Henry Ford first developed a concept of manufacturing assembly line in constant motion - the first method for mass production. The model of Henry Ford for a worker in the most simple and repetitive tasks have been replaced by job rotation and teamwork, mainly to improve employee morale, but also provide significant benefits in terms of higher quality and suggestions of employees to improve the process. This model is changing the way managers see production, the emphasis is on the specialization of information work performed by unskilled labor. The spread
of mass lower cost per unit, work standardization, volume products supported by the school and the founder of scientific management Frederick Taylor. Until Taiichi Ohno Toyota Group in Japan pointed out some flaws in the model, the effect of the model is not challenged by managers. Mass production requires a large amount of capital and space, poor quality of products, high inventory levels of materials needed in product standardization and related organizations are resistant to change and very flexible in demand of customers.

Poor production defined two methods for existing production systems, namely, handicraft production and mass production. In artisan production, skilled workers using relatively simple but highly flexible tool for producing one type of product to meet specific customer needs. Highly standardized and design products that will take place in large volumes of relatively low-skilled labor inflexible and expensive machines used in mass production. A new concept called the Toyota Production System (TPS) was developed by Ohno. TPS supports many innovations, including the elimination of waste motion quality at the source-jidoka, kaizen, continuous improvement. Light Production concepts are not necessarily limited to the provision of supplies and materials themselves. Its purpose is to make them more efficient, reduce errors and improve processes. In fact, it must permeate all activities to add value to your company.

2.2.1 Lean Definition

In research (Hines et al., 2004) raises awareness of the vision of managers. The main aim is to develop lean philosophy and develop an understanding level of the hypothetical foundations of organizational culture. In the machine that changed the world, (Womack and Jones, 1990) claim that the implementation of an approach will change almost everything in all industries - options for consumers, the nature of work and the wealth industry by combining the benefits of art and mass production. Lean tactic contains several methods, its purpose is to improve the quality, efficiency, and responsiveness to customers. Lean as a concept has evolved over time. The researchers based their research effort on the structural framework proposed by (McGill and Slocum 1993) for the association between values and achieve balance cost and cost value.
Todd (2000) defines Lean Production as an initiative, which aims to reduce waste of human effort, inventory, time to market and production space to respond to customer demand and produce the highest quality products in the world," the most well-organized and inexpensive way.

The curiosity in constant development led to the concept of a learning of the organization and opens a new opportunities for improvement and achieve long-term sustainability. In direction to demonstration the development of the idea of Lean from the original application of the first major use as a technique to target today's culture to improve organizational learning, the four steps in the development of the Strategy reading are discussed in detail:

McGrill and Slocum (1993) classified four types of organizational learning as mentioned in Figure 2.2 (Hines and Rich, 2004). The steps in the development of lean philosophy are related to the different stages in the growth of organizational closure. (Fiol and Lyles, 1985) in accordance (Hines, Holwe and Rich, 2004) defines organizational learning as the process of improving actions through better knowledge and understanding.

"Knowledge Organization" is the first type of organization. Respond to the first phase of the approach slope, that is, the cellular cells and plant assembly lines. It is categorized by main lean consciousness as the confidence that there is an improved way of performing the things is established. This principal step is often comparable to approach the scientific management of Max Weber (1964) and Frederick Taylor (1996). This phase covers up the first span of poor education between 1980 -1990. Stand for a policy that applies the tools and techniques, methods. The original source of lean thinking at the time was the automotive industry.

"Understanding the organization" is the second type of organization run by clarifying and communicating the core values and management methods to strengthen the corporate culture. Different Enterprises in this particular period in the mid of nineties are influenced that lean is to apply the method of best practices, but this only happens on the factory floor. At the end of the decade until 1999 begins repositioning of lean thinking can be used in a wider range of industrial environments (Womack et. al, 1996). It is the commencement of awareness to find solutions to the individual company and its improvements along the value chain.
What kind of association in this stage is called "learning organization". Typically, the application of value stream analysis and five Lean principles is developed by Toyota. Although some of the methods and tools are challenged, the organization is inclined at this stage ignores some other important processes such as new product development, new business opportunities, which prevents the organization to ensure the sustainability of continuous improvement.

The new century will take into account factors such as industry, size, the technology used. This means a higher degree of unanticipated events. The focus shifted to creating value for the customer. This model is a "learning organization", which means the opportunity to develop the knowledge of employees, suppliers, customers and even competitors. Any change is seen as the ability of a system to learn and improve.

The authors (Mefford and Crute, 2004) investigated the process of lean thinking and its development over time. They have described and identified four important steps in its development. Knowledge is spreading beyond its origins Toyota production system. Many critics try to attack the weak, but what seemed to forget is that Lean has evolved and continues to evolve as a complete management system.

Lean manufacturing is developed by Taiichi Ohno at Toyota Motor Company in the 1950s as a technological innovation based on the principles of the minds and hands of the era of the artisans, together with the standardization of work and Ford base management unit and strong teamwork, for good, Edwards (1996) quoted in action (Motwani, 2003).

Lean manufacturing is about improving and changing the process so that the knowledge of the variation is essential for understanding the slope. It also requires the "re-engineering the entire process, making the system more stable with less variation common cause" (Deming, 1986). The basic principle of Lean is responsiveness to change and waste minimization. Take the example of Toyota, Lego and many other companies in the industry in the construction and aerospace industries contributed Lean model to achieve significant performance improvements by increasing efficiency in terms of cost, quality and time. Womack and Jones (1990) are the first authors to bring out the advantages and characteristics of model performance improvement after a thorough examination of the production
plant in Toyota. The main point is that companies can become much more flexible and responsive to customer needs by applying the five principles of Lean. According to Womack, the contribution of the book "The Machine that Changed the World" (1990) for the presentation of the Toyota Production System (TPS) as part of the operation of the system, the overall management of Toyota and link the production process, the process of customer management and management practices and the political process for the entire company. Lean thinking can be summarized as refine and improve the identification value of the current value, making the flow of products so that customers extract value and pursue perfection under (Womack et al., 2003).

2.2.2 Lean Principles

In the 1970s, it became clear to a select few that the Japanese, most notably Toyota, had found a better way to manufacture cars, which caused a number of very interesting things to happen (Hines et al. 2004). First, and most notably, the majority of the manufacturing world went into a huge case of denial. This was heard as “that will work in Japan, but not here” and a variety of other statements that could politely be said to have lacked insight. However, some with a little more insight, curiosity, and humility asked, “Could there be something to this?” Well, from that small group came a series of efforts to try to capture parts of the Toyota Production System that were serving Toyota so well. The piece that seemed the most appealing was the Just in Time concept (Womack et al. 1990). It was rapidly popularized as an inventory reduction effort, which in fact is only a part of what it really is. Just in Time practitioners came out of the woodwork and many companies went about implementing kanban and slashing inventories to reduce the high cost of producing and managing the inventory. Some went about using the slogan of “Zero Inventory” and slashed inventory with such fervor it was as if they were pursuing the Holy Grail of manufacturing. Inventory had become a bad word, much like “scrap.” Unfortunately, many of these efforts were grossly misguided. Their only focus was on inventory reduction. They reduced inventories as if it were an independent entity that had no relationship to anything else. Just in Time implementation efforts became nothing more than aggressively slashing inventories. Those that had this approach often caused irreparable damage. They found they needed to expedite
nearly everything, needed to work large amounts of overtime, and then still frequently missed delivery dates. Others found the worst of all scenarios. They not only missed shipments but as they cut inventories they found that production rates flagged significantly. Due to these misguided efforts, many companies ceased to be competitive and some even went out of business. When the organization implements lean practices only in structures than its lean organization. When lean thinking applies to all activities -adding value within the organization and between the organization and its suppliers, the authors (Shah and Ward, 2007) propose the term "Lean Enterprise". As shown in the Figure 2.1 of the Lean house to keep together all the necessary elements of the company read. Each of these factors is important to be present so that they get the full benefit of the company adopts. The base of the structure is successful Lean implementation team of human resource management. The philosophy of the first reading, which is mainly related to the appropriate leadership and commitment at all levels of management to senior executives. The focus is on perfection to meet customer needs and continuous improvement, learning and reduce waste. The second layer is the human resource management (HRM), self-determination and participation in the implementation of the treatment as a key success factor, as it focuses on "teamwork". Share value of lean principles, employees are what make things happen. The following shows the need to help the company to improve their core processes with a focus on "waste reduction". Within the organization, the production of "best practice" is "just-in-time" (JIT), total productive maintenance (TPM) and total quality management (TQM), which contribute to waste reduction. On the other hand, these basic activities conversations include marketing, new product development (NPD), partnerships with suppliers and customers. The roof of the house is a thin and narrow culture that supports the objectives of the roof and the results. Lean culture will solve the problems in the learning process goes on the path of continuous improvement. Culture is both a result and a facilitator of an economy sustainable and successful business (Liker, 2004). It has the function of a role model to guide employees through organizational values lean thinking changes. At the top are the results through the application of Lean - all goals and results of lean thinking for high performance. The results are related to better quality, lower cost, shorter
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delivery, morality of senior employees, questions about safety at work, better business results. These results give the company a competitive advantage (Womack et al., 1990).

To become Lean requires a specific way of thinking, philosophy and management system that follows Toyota model "4P" Toyota. Liker (2004) describes in his book "The Toyota Way" fourteen principles that have been the basis for the Toyota Production System (TPS). The author shares these principles into four categories that start with the letter "P" - philosophy, process, people and partners and troubleshooting. This model is known as the "four P's" Toyota (Liker 2004), the five principles of the lean application specified by (Womack and Jones, 1996) accepted the key to successful implementation. The application of these five steps must occur at all levels of the organization and requires a complete transformation of the existing business. A real challenge is to know how to begin. The first step is to carefully define the value of the customers. It is important that the flow of the guaranteed value of the organizations and divisions of each company.

If the value is not set correctly, it can lead to the wrong product or service with a great waste of the organization. Second, identify the entire value stream and eliminate waste. The three critical activities at this stage are the product definition, management of information and physical transformation. The design of the facility is not necessary to change first, because that's how the work is better organized and visibility allows administrators to detect errors and problems that occur, to be determined. The new reorganization is necessary mainly because of the introduction of new technologies, workflow organization, and the introduction of job boards. Does the passage of liquids require innovation? Managers believe that the flow can only be achieved through continuous incremental improvements. But it is likely that poor conversion occurs only if the lean thinkers resort to radical improvements would build a complete system of new business. The next step is to enable the end customer to pull the product you want in the system if necessary. In this case, it reduces the high cost of inventory. The cure for perfection is the final stage of implementation. It is very important that all steps are performed together so that the impact of each of them is strong enough to improve the performance of others. Poor production is also comprised of eight principles (Ahlstrom and
Karlsson, 2000): waste, zero defects, scheduling thrust, multifunction machines, delay, team leader, vertical information systems and continuous improvement. In the system, read the emphasis is primarily on reducing waste of all kinds. The emphasis on eliminating waste and continuous improvement, combined with a strategic focus for the company to ensure a reduction in quality defects will always be the first. To achieve this goal, the employees are trained to use various methods of hypothetical evidence on how to identify problems and find appropriate solutions to them. Find sources of variation and waste and developing methods to remove them. Another lean faith (Mefford, 2009) is that the process can always improve a little more, regardless of the fact how good it is and focus and management should encourage employees to think in this direction is always looking for a better way to do things. The vast majority of economic activity, such as construction and housing, transport, food supply system, manufacturing and personal services, are only affected for a long time if they do. The new technology and investment in human capital can generate long-term growth, but evil thoughts turned power to produce green shoots of growth throughout the province in a few years. Lean thinking works well when applied holistically (Womack, Jones, 1996). The problem is a taste of the managers with the knowledge and energy to make the jump, take heroic to properly set up the value, identify the value stream and flow values increase customer perfectly. Womack and Jones (1990) argue that Lean can be applied not only in the manufacturing context but also in another organization. The system is definitely value for manufacturing companies that have examples of Toyota. Lean always associated with reducing costs, eliminating waste, delivery just in time (JIT) (the term "lean" is also considered "the former name for the just-in-time" (Holweg, 2007).

A study shows how the introduction of Lean is beneficial for the knowledge-based activities such as design, the introduction of new products, technology and product development. Baines et al., (2006) said the popular weight today is on customer value in the "value" in a broader context of various useful activities, and how to maximize this value. (James Moore et al., 2006) also argues that the engineers have to move from the production method, where the main focus is to reduce waste are to identify and evaluate them. Chappell (2002) defines applying lean thinking to all
aspects of a business and a positive effect not only on production but the full range of business processes, including product development, design, and sales. (Womack et al. 1996) define lean thinking as a "multi-dimensional way of doing business with a focus on reducing waste." The eight wastes include error correction, overproduction, unnecessary production steps, unnecessary movement or transportation of employees, unnecessary movement or transport of goods, people waiting for products or services that do not meet customer needs. Liker (2004) added to the employee creativity is not used as an important type of waste; which is important for successful implementation, the author emphasizes that all employees in the organization must accept and understand the purpose of the adoption of rational thinking and participate. The authors developed a conceptual framework based on lean thinking work (Liker, 2004; Shah, Ward 2003) and guide the (Shingo Prize, 2005). The framework met all supervisors thought and the relationships between them for a successful lean implementation. It contains the methods, principles, and processes necessary for the adoption of lean thinking throughout the organization. Lean thinking "as an integrated management approach," which has an impact on the entire organization and its stakeholders - suppliers and other business partners, customers, etc.

![Conceptual framework for studying lean thinking](http://juan.pallares.me/images/leanhouse.png)

**Figure 2.1. Conceptual framework for studying lean thinking**
(Source: http://juan.pallares.me/images/leanhouse.png)
2.2.3 Lean Manufacturing-A History

Lean Manufacturing or Lean Production refers to a business where the objective is to minimize the time and resources used in manufacturing processes and other activities in a company, with emphasis on eliminating all forms of waste. Manufacturing / Lean Production has been a concept that has been in common use since the early 90's when Womack and Jones first used to describe the Toyota production system. Since manufacturing environments vary due to differences in purpose, design, and control, there is no single set of management practices that can be adapted generally to rule. Manufacturers are under tremendous pressure to improve productivity and quality while reducing costs. This has led many organizations to implement the Toyota Production System (TPS), also known as lean manufacturing (Liker, 2004; Womack, 2003). TPS uses several tools to strategically align not only production but the facilities of its suppliers in the process of disposal of such waste (Berg and Miller McWright, 2009). Half of human labor in the factory, half the manufacturing space, half the investment in tools and half the engineering hours to develop a new product (Womack et al., 1990).

![Figure 2.2 Lean Evolutions](Shah & Ward (2007))

Lean manufacturing is most often associated with the elimination of seven major waste to enhance the effect of variation in the supply, processing or demand (Shah and Ward, 2007). Sawhney, Teparakul, Aruna and Li (2007) shows the relationship between light production and the environmental movement stating that "it is natural
that the lean concept, the vision inherent value stream and its focus on the
systematic elimination of waste, lace global strategy with environmental
protection," they call Lean environment (in-Lean). According to (Mendel 1983)
lean manufacturing are the following forms of "waste" and must be eliminated:
1) Over processing;
2) Waiting;
3) Transport of inventories;
4) Inventories;
5) Defective units;
6) Unnecessary motion;
7) Overproduction

2.3 Critical Success Factors of Lean Practices

2.3.1 Overview

Rockart (1979) has defined the CSFs as "the limited number of areas in which
results, if they are satisfactory, will ensure successful competitive performance for
the organization". Critical success factors are crucial to the success of a program,
and if the objectives associated with these factors are not achieved, the application
program will also lead to failure (Rockart, 1979). According to (Boynton and Zmud,
1984), the CSFs are “those few things that must go well to ensure success”. The
CSFs are the actions and processes that can be controlled by the management to
achieve the organization’s goals (Brotherton and Shaw, 1996). Any improvement
initiative means high expenditure, investment (Ranjan and Bhatnagar, 2008) and
high risk (Umble et al., 2003) for an organization. So it is important to identify the
factors that can determine the success of the implementation and avoid the risk of
failure. If these CSFs are not emphasized, not only there could be a significant
difference in the success gained, but also losses in terms of effort, time and money
(Coronado and Antony, 2002). The critical success factors are essential parts that
must be addressed by management or the manager to ensure that 'things must go
right' for a project or activity to achieve management objectives and business
growth. In the context of Six Sigma project implementation, CSFs represent the
essential ingredients without which the implementation stands little chance of
success.
Achanga et al., (2006) identified four key factors that are crucial for the implementation of Lean Manufacturing in SMEs. The factors are organizational culture, leadership and management, competence and financial capacity.

Sua'rez-Barraza and Ramis-Pujol, (2010) identified several opportunities and inhibitors during the execution of lean kaizen in a Mexican public service organization. Activators and inhibitors are as follows.

Enablers:

- Clear loop to improve productivity
- Commitment and desire for improvement
- Effective application of the best inhibitors of human resources management
- Establish a system to measure the performance of service processes
- Resistance to change by employees who enjoy their own share of power (influenced by the union) and their own way of doing things in HR sections (a legacy of procedure in this type of area).
- An "organizational structure" bureaucratic classic mode
- The influence of unions with little interest in change and/or improvement.
- The lack of professional training in Lean Kaizen techniques and tools.
- Service is the result / client / stakeholder-oriented
- Focus on the simple and practical leadership
- Description and transversal thinking
- Effective application of the best inhibitors of human resources management
- The lack of credibility of some middle managers, these efforts are seen as enforced by a force management team or a fashion.
- Excessive regulation can block you thinking about the improvement and quality of service.
- The lack of a strong link between lean kaizen's efforts and the best HRM practices needed to consolidate them.
Resistance to the measurement of generating an action as a result of the measurement of "culture" inadequate or non-existent in the form of execution the service processes.

According to (Rathje-Scherrer et al., 2009), due to the implementation of lean success exclusively on: support for management's commitment and involvement in the work to learn; Give the employees to decide on changes in business processes; Information transparency in thin target; and evidence of improvements in the initial performance and weak sustainability. The six lessons for effective Lean implementation are:

- Lean will not succeed without visible management commitment
- Develop formal mechanisms to encourage independence
- Disseminate medium-term lean objectives
- Make sure there are agreements for the long-term sustainability of lean
- Communicate few benefits from the outset
- Continuous assessment during lean effort is critical

Cheng et al., (2011) identified the types of resistance: resistance to a power outage, new routines, change and the state of infrastructure.

An analysis of the research literature by (Skrudupaite and Jucevicius, 2011) revealed the following key success factors in the management of SPS (Synchronized Production System) Application process: business plan and vision; Management support (including funding); Project management (including project promoters and teamwork and composition); Change management, organizational culture; Effective communication, training, knowledge transfer, knowledge management (including skills); organizational structure; Monitoring and evaluation of results: performance measures.

Kumar et al., (2009) identified the importance of the following critical success factors in implementing Six Sigma or small: Participation and management commitments; communication; The quality of the relationship with the employee, cultural change; Training; The quality of the association client, project selection; Link quality of enterprises, the quality of the link with the supplier; project;
Organizational infrastructure; Vision and plan, information technology and innovation.

Crute et al., (2003) considered five factors that are important for the lean implementation of the aviation industry: A specific and comprehensive strategy change; Effects of company culture; Product analysis; the commitment of senior management; Performance improvement time.

Kettinger and Grover (1995) quotes that a significant change in the process requires the following success factors: strategic investment managers acting as leaders in defining and communicating the change vision; The desire to learn; Preparation for culture; Retained relationships network; Knowledge exchange; Prescribed processes and change management methods lies mainly in implementing Lean with aging and then work duty and lack of leadership involved in this research on the site. Grove et al., (2010) identified the obstacles they face during a lean implementation in a healthcare environment. These were: (Mefford, 2009) identified the following four essential components for successful implementation of lean. Believe in the new program will serve; Commitment to the implementation of the managers; Participation of the entire organization - employees, resources; Patience and long-term vision for the results. According to (Pedersen and Huniche, 2011), the following factors are important for the implementation: Goals and values; Complexity and importance; Balance of power; and the resources and capacity.

According to (Sim and Rogers, 2009), the problem maximum variation process; A lack of understanding of lean; Lack of communication and leadership; Focusing goals; Defines waste problems and it is difficult to identify customers and value from the customer's perspective. The obstacles that support the implementation can be overcome with forward-thinking planning, transformational leadership, good communication, identification and sharing of best practices and, above all, a common vision.

Henderson and Evans (2000) listed seven components for the successful implementation of Lean Six Sigma as senior management support, organizational infrastructure (OI), training, tools, associated personnel based measures, measuring systems and infrastructure.
Antonio and Fergusson (2004) identified ten key success factors for driver software company study, this commitment to leadership and uncompromising commitment of the senior management, support Organization infrastructure, cultural exchange, training Six Sigma, commitment to customers, and understanding of the Six Sigma methodology, project management, prioritization and selection of projects. The results from this study also show that the most critical factors for success are dedication and uncompromising commitment to management, cultural change, linking Six Sigma with the business strategy and customer participation.

Bhasin (2011) found the following barriers to application support: The need to convince shareholders / owners; inadequate external financing; insufficient internal funds; Lack of understanding of the potential benefits; The cost of the investment; cultural issues; Inadequate handling time; Insufficient knowledge of Lean implementation; Employee attitude / resistance to change; Adequate knowledge oversight to apply lean.

Shibani Zargun et al. (2014) found and recommended the following CSFs for developing countries and are classified into four main types:

<table>
<thead>
<tr>
<th>Strategy and objectives</th>
<th>Leadership and management</th>
<th>Human resources</th>
<th>External factor</th>
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<tbody>
<tr>
<td>Clear target and common understanding of direction</td>
<td>Top management support and commitment</td>
<td>Providing workers with continuous lean education and training</td>
<td>Communication and cooperation</td>
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<td>Consistent focus on continuous improvement</td>
<td>Identifying the need of lean</td>
<td>Ability and willingness to change</td>
<td>Understanding customer values</td>
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<td>Credible planning for campaign</td>
<td>Effective motivation and reward system</td>
<td>Champion and change agenda</td>
<td>Tax laws ,trade agreements ,political environment</td>
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<td>Change of organization directions</td>
<td>Leadership style</td>
<td>Multidisciplinary team work</td>
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<td>Systematic conversion strategy</td>
<td>People involvement</td>
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<td>Organizational structures</td>
<td>Knowledge transfer and training</td>
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Figure 2.3: Summary of CSFs for developing countries  
(Source: Hines et al. 2004)
Prattana Punnakitikashem et al., (2012) investigated factors affecting the success of lean implementation in Thai logistics companies:

Figure 2.4 critical success factors to the success of lean implementation
(Source: Bakas et al. 2011)

Bakas, Ottar et al., (2011), identified in his study of Norwegian and Belgian SMEs that was held in the European research project EIRP (European Regions for Innovative productivity). Six proposed critical success factors, which is consistent with previous research: 1) ensuring a strong management commitment. 2) Develop employee participation in depth. 3) Allocate enough time to prepare the organization. 4) Focus on creating motivation to complete the initiative. 5) Build knowledge internally within the organization. 6) Establish a performance evaluation system.

M.M. Ravikumar et al (2013) found seven critical factors for SMEs

- Employees are trained in the application
- Fearless message about identifying waste management and leadership
- Strong commitment capacity.
- Financial willing to provide sufficient funds for the implementation
- Link Lean initiatives to improve business strategy and client
- Accept change in faith and organization culture.
- The ability of providers to support the implementation reading
Table 2.1: Critical Success Factors of Lean Manufacturing

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<th>Factors</th>
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<td><strong>Change in Management and Organization culture</strong></td>
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<td><strong>Employee Involvement and Trust</strong></td>
<td>Pannizolo (1998); Liker (1998); Motwani (2003); Kotter (2007); Czabke, Hansen and Doolen (2008); Mefford (2009); Alskari O.(2012); S Mostofa (2013)</td>
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<td><strong>Supplier relationship and Integration of Networks</strong></td>
<td>Pannizolo (1998); Henderson and Evans (2000); Motwani (2003); Seth and Gupta (2005); Doolan and Hacker (2005); Bhasin and Burcher (2006); Shah and Ward (2007); Gurumurthy and Kodali (2009); S Mostofa (2013)</td>
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<tr>
<td><strong>Willingness to learn Skill and Expertise</strong></td>
<td>Henderson and Evans (2000); Coronado and Antony (2002); Motwani (2003); Hines (2004); Pius Achanga (2006); Bhasin and Burcher (2006); Womack (2006); Abdul Manek (2006); Bines (2006); Shah and Ward (2007); Kotter (2007); Prattana Punnakitikahen (2012); S Mostofa (2013)</td>
</tr>
<tr>
<td><strong>Management Commitment and Communications</strong></td>
<td>Yasin and Wafa (1996); Henderson and Evans (2000);</td>
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<tr>
<td>Literature Review</td>
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<tr>
<td>Chong et al (2001); Coronado and Antony (2002); Motwani (2003); Crute (2003); Seth and Gupta (2005); Doolan and Hacker (2005); Worley and Doolan (2006); Pius Achanga (2006); Bhasin and Burcher (2006); Shah and Ward (2007); Kotter (2007); Sahoo (2008); Czabke, Hansen and Doolan (2008); Gurumurthy and Kodali (2009); Mefford (2009); Prattana Punnakitikahen (2012); Alskari O. (2012); S Mostofa (2013)</td>
<td></td>
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<tr>
<td><strong>Performance Monitoring</strong></td>
<td>Pannizolo (1998); Geanidy and Karwowski (2003); Seth and Gupta (2005); Doolan and Hacker (2005); Pius Achanga (2006); Womack (2006); Abdul Manek (2006); Shah and Ward (2007); Sahoo (2008); Gurumurthy and Kodali (2009); Alskari O. (2012); S Mostofa (2013)</td>
</tr>
<tr>
<td><strong>Financial Capability and Budget</strong></td>
<td>Seth and Gupta (2005); Pius Achanga (2006);</td>
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</table>
The authors developed a conceptual critical success factors as per table 2.1 for lean Practice implementation, based on the critical literature review. Critical Success factors are collected as a promoter/enabler of lean practice and its relations amongst

<table>
<thead>
<tr>
<th>Critical Success Factors</th>
<th>References</th>
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<tbody>
<tr>
<td><strong>Customer Involvement</strong></td>
<td>Pannizolo (1998); Doolanand Hacker (2005); Abdul Manek (2006); Shah and Ward (2007); Kotter (2007); Gurumurthy and Kodali (2009)</td>
</tr>
<tr>
<td><strong>Process Management</strong></td>
<td>Pannizolo (1998); Liker (1998); Henderson and Evans (2000); Coronado and Antony (2002); Doolanand Hacker (2005); Pius Achanga (2006); Bhasinand Burcher (2006); Abdul Manek (2006); Shah and Ward (2007); Sahoo (2008); Gurumurthy and Kodali (2009); Alskari O. (2012); S Mostofa (2013)</td>
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</table>
them for a successful implementation. It also contains the methods, principles, and processes required to adopt lean practice throughout the organization. Lean Practice "as an integrated quality management" that affects the entire organization and its stakeholders - suppliers and other business partners, customers, etc.

2.4 Performance Measures of Lean Manufacturing Practices

2.4.1 Overview

Key performance measures of Lean practice and its application are presented with special attention to the leadership. There has not been any literature that integrates the performance management of Lean Practice for the SMEs. Therefore, more research is needed in this area because of its relevance (Achanga, 2005), (Collins, 2001). The need for early integration of the concepts of a performance measures supports a Lean implementation mentioned by (Ahlstrom and Karlsson, 1996) could be confirmed in the case study. PM covers the entire value chain to support the paradigm shift away from thinking the individual process and can also provide opportunities for improvement. The development of the concept of the PMs in the three phases mentioned (Bourne, 2000): designing performance measures, its implementation, and use. During the development and selection of adequate"relevance" (to connect with business objectives and support the principles of efficiency) and "practical" (in the sense of applicability of the measures essential tool important criteria blank discs, paper or a simple computer program), quality, time and flexibility mentioned as operational measures. Apart from this, the economy, customer satisfaction, and human resources also cited by measurements reviews Hudson. These dimensions (in particular operational and financial indicators) should be integrated into the concepts of a correspondent PMs. In addition to the critical success factors must be considered for the concept of the PMs. Since this document focuses on the practical application of Lean principles, or the dimension or strategic "customer satisfaction" dimension is treated in detail. But the authors wish to underline the importance of these dimensions, which really should be considered in the later stages of the implementation of Lean. The concept of PMs takes into account the traditional performance measures with a focus on Lean principles and includes performance dimension of "leadership", derived from critical success factors (Achanga, 2005). There is no concept of PMs Known by the
authors to integrate the "performance management" in relation to an application project Lean in the measurement system. Because leadership has proven to be one of the most important critical success factors according to a study by Collins (2001), analysis of the reasons for the success of the "Fortune 500" companies, integrating Leader performance in the basic idea of the authors. It is, therefore, essential that the commitments and managing agents of change to be monitored and their commitment and performance during the implementation of Lean can be taken according to Womack and Jones (1996). Examples of such measures are to help the smallest number of seminars by management, active participation of the directors of Kaizen activities or associated with production and management meetings with efforts to lean in the implementation of its program. The whole concept of the KPI is presented measured performance operating costs, quality and time, people and organizational performance, leadership, performance and specific Lean statistics.

![Figure 2.5: Performance Measures concept consisting of five dimensions](https://www.qimacros.com/quality-tools/balanced-scorecard.jpg)

Implementing lean manufacturing without the use of structured performance measures will not lead to changes in the operational performance of the frame structure for performance measurement is not well understood. Framework measurement will be composed of well-defined measures at the enterprise level -
linkages that identify relationships between actions at multiple levels, and a single set of coherent measures in context (Fullerton and Wempe, 2009) warn that adoption of manufacturing efficiency will produce mixed results - especially if no measure of non-financial performance has been implemented. Performance measure helps bridge the gap between efficiency in manufacturing and the effect on the financial result.

**Table 2.2: Performance Measures of Lean Practice**

<table>
<thead>
<tr>
<th>Performance Measures</th>
<th>Authors</th>
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<tbody>
<tr>
<td><strong>Financial Performance Impact</strong></td>
<td>Pannizolo (1998); GeanidyandKarwowski (2003); Seth and Gupta (2005); Pius Achanga (2006); Shah and Ward (2007); Sahoo (2008); GurumurthyandKodali (2009);</td>
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<tr>
<td><strong>Productivity Growth</strong></td>
<td>Pannizolo (1998); GeanidyandKarwowski (2003); Seth and Gupta (2005); Doolanand Hacker (2005); Pius Achanga (2006); Womack (2006); Abdul Manek (2006); Shah and Ward (2007); Sahoo (2008); GurumurthyandKodali (2009); S Mostofa (2013)</td>
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<td><strong>Cost</strong></td>
<td>Pannizolo (1998); Liker (1998); Henderson and Evans (2000); Coronado and Antony (2002); GeanidyandKarwowski (2003); Motwani (2003); TajandBerro (2005); Seth and Gupta (2005); Doolanand Hacker (2005); Worley and Doolan (2006); Pius Achanga (2006); BhasinandBurcher (2006); Abdul Manek (2006); Bines (2006); Shah and Ward (2007); Sahoo (2008); Czabke, Hansen and Doolen (2008); GurumurthyandKodali (2009); Mefford (2009); Prattana Punnakitikahen (2012); S Mostofa (2013)</td>
</tr>
<tr>
<td><strong>Delivery</strong></td>
<td>Henderson and Evans (2000); Coronado and Antony (2002); Motwani (2003); Hines (2004); Pius Achanga (2006); Bhasin and Burcher (2006); Womack (2006); Abdul Manek (2006); Bines (2006); Shah and Ward (2007); Kotter (2007); Prattana Punnakitikahen (2012); S Mostofa (2013)</td>
</tr>
<tr>
<td><strong>Customer Satisfaction Impact</strong></td>
<td>Pannizolo (1998); Liker (1998); Henderson and Evans (2000); Coronado and Antony (2002); Doolan and Hacker (2005); Pius Achanga (2006); Bhasin and Burcher (2006); Abdul Manek (2006); Shah and Ward (2007); Sahoo (2008); Gurumurthy and Kodali (2009); S Mostofa (2013)</td>
</tr>
<tr>
<td><strong>Flexibility</strong></td>
<td>Pannizolo (1998); Liker (1998); Motwani (2003); Kotter (2007); Czabke, Hansen and Doolan (2008); Mefford (2009); S Mostofa (2013)</td>
</tr>
<tr>
<td><strong>Quality</strong></td>
<td>Yasin and Wafa (1996); Henderson and Evans (2000); Chong et al (2001); Coronado and Antony (2002); Motwani (2003); Crute (2003); Seth and Gupta (2005); Doolan and Hacker (2005); Worley and Doolan (2006); Pius Achanga (2006); Bhasin and Burcher (2006); Shah and Ward (2007); Kotter (2007); Sahoo (2008); Czabke, Hansen and Doolan (2008); Gurumurthy and Kodali (2009); Mefford (2009); Prattana Punnakitikahen (2012); S Mostofa (2013)</td>
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</table>
Many authors (see Table 2.2) discussed the role of PMs in SMEs. PM is an important element in the integration of supplier partners. Typical information shared includes namely inventory levels, production plans, demand forecasts and supply capacity (Prajogo and Olhager, 2012; Ding et al., 2011; Yang and Maxwell, 2011). The Lean integration (LI) is critical process as it reinforces connectedness, coordination and collaboration among SMEs members (Koçoglu et al., 2011). The appropriate Lean strategies has a significant effect on CSFs which may reduce uncertainty. Pandey et al. (2010) examined effect of different types of PMs on the competitive strengths of the manufacturer for Indian manufacturing organizations. They found that PMs has significant impact on the competitive strengths of the manufacturer in order winning parameters like cost effectiveness and service level. The PMs is an important means of enhancing a customer relationship. PMs improves buyers’ performance with respect to resource usage, output, and flexibility. The extent of PMs between a buyer and key supplier depends on uncertainty and, interdependency of information (Yigitbasioglu, 2010).

2.5 **Scope of Work/ Future Perspectives:**

The aim is to research through professional practice in the field of Lean Manufacturing especially in a Manufacturing sector as it is growing sector in India and Gujarat especially. The aim is to develop a model for small-to-medium scale manufacturing industries which helps them to improve productivity continuously. At the outset, the researcher can entitlement that the said objective has been accomplished through survey based research as presented in forthcoming chapters. The research can be distributed into mainly literature review, development of survey instrument for SMEs, development of model and validation phase. The choice of the theme selected after the critical review of the literature and the problem is formulated after the gap analysis, The choice of the theme selected for critical review of the literature and the gap analysis problem is formulated, the reason for the selection of theoretical research is also personal interest.

The critical review of the literature revealed a gap in the knowledge of the critical success factors for lean manufacturing and operational performance indicators and the relationship between them. Lean Manufacturing performance model has not
been developed in the industry in small and medium-sized Gujarat. From a personal point of view, the research study has been of interest to researchers working as lead auditor for over two years and regularly participates in numerous seminars and conferences related to the technical quality every year and the presentation of research in this area.

The fierce competition in the market has forced companies to rethink industrial rules for their implementation in manufacturing. Manufacturing organizations in India are showing great interest in the introduction of advanced manufacturing technologies and associated management and quality.

2.6 Objectives of Research:

This program of study continues industrial research and professional practice in the field of lean manufacturing especially in a manufacturing sector as it is growing sector in India and Gujarat especially.

This research study is undertaken to meet following main objectives:-

1. To develop a lean practice model for lean manufacturing implementation for manufacturing small and medium scale industries (SMEs) of Gujarat.

2. To validate a lean practice model for lean manufacturing implementation in selected manufacturing small and medium scale industries (SMEs) of Gujarat region.

3. To discover critical success factors of lean manufacturing implementation for small and medium scale industries and organizations performance measures through survey – based research.

This research study is undertaken to meet following Secondary objectives:-

1. To articulate and develop meanings and operational measures of lean critical success factors(CSFs) and lean organizations performance measures (PMs) by involving industry managers / employees practicing lean manufacturing tools and techniques as the appropriate subjects.

2. To find out the challenges faced by the organizations in the implementation of lean manufacturing practices.
3. To ascertain the penetration of lean manufacturing drive among Gujarat’s small and medium scale industries.
4. To determine the relationships amongst critical success factors and operational performance measures of lean manufacturing practices.

2.7 Chapter Summary
The chapter reveals about the most important part of the study which is literature review for the selected theme of research. After reviewing many papers and articles about various lean manufacturing tools and techniques, authors have applied the set of keywords i.e. critical success factors, performance measures and lean framework for inline research tactic. Finally conceptual critical success factors have been investigated (total eleven factors) and organization’s performance measures (total seven measures) for exploring the model input and development.