

Framework of Critical Success Factors for Lean Implementation in Vietnam Manufacturing Enterprises

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Abstract: Lean manufacturing is a popular approach for organizations to improve productivity [1]. Lean manufacturing focuses on the systematic elimination of wastes and non-value added activities in production. Lean manufacturing was originally introduced by Toyota Motors in the 1950s as a secret weapon to secure advantage over competitors. Although many enterprises succeed in applying lean manufacturing around the world, less than 20 per cent of them have achieved and maintained lean activities for an extended time. This research presents critical factors for constituting the successful implementation of lean manufacturing in Vietnam enterprises. Six dimensions in a lean manufacturing transformation model are presented in the research, specifically: (1) Strategic initiatives, (2) Process management, (3) Change management, (4) Human resource management, (5) Situation management, and (6) External management.

Keywords: Lean manufacturing, critical success factors, manufacturing enterprises.

1. Introduction

Globalization and emerging technologies have enormous impacts on the manufacturing industry around the world. Lean manufacturing (LM) will be a standard manufacturing model in the 21st century [2]. The main strength of LM is that it is capable of reducing manufacturing costs through the elimination of all types of waste. It will guide a company to become a world-class organization [3]. This approach in eliminating waste has made a substantial impact on manufacturing companies resulting in higher

performance enhancements and significantly improved delivery, quality, flexibility and manufacturing costs [4].

As a result, many companies have saved millions of dollars in reducing cost via waste elimination (such as over-production, defects, over-processing, delays, and inventories...). Other companies around the world have also succeeded in LM implementation [5]. However, not all enterprises can claim to have had the same benefits. According to Kilpatrick and Osborne (2006), fewer than twenty percent of the companies have succeeded in implementing LM for more than one year [6].

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In Vietnam, LM was introduced after the 1990s as a new approach for organizations in productivity improvement, cost reduction, and quality assurance. Several Vietnamese enterprises have applied LM tools and techniques and achieved highly encouraging results, such as Garment No 10 Company, Fomeco Company, LeGroup Company, and VPIC1 Company... However, LM in Vietnam is still a new concept for most organizations. As mentioned above, the ratio of successful enterprises in Vietnam is not high, just less than one percent [7].

These contrasting results make LM implementation a complex and central process. Therefore, the critical success factors (CSFs) in the implementation of LM must be identified. This research aims to outline the factors that are perceived as critical for the successful application of LM.

2. Literature review

2.1. Lean manufacturing

Lean manufacturing is an integrated set of principles, practices, tools and techniques designed to address the root causes of operational underperformance. It is a systematic approach to eliminate the sources of loss from entire value streams in order to close the gap between actual performance and the requirements of customers and shareholders. Therefore, the objective of LM is to optimize cost, quality and delivery, while improving safety. Accordingly, LM tries to eliminate three key types of losses in operation: wastes, variability and inflexibility [8].

The term LM was first introduced in 1990 in the book of “The Machine that Changed the

World” published by Womack and Jones. LM as a secret weapon is responsible for wastes elimination and quality improvement, hence cost reduction within organizations [9]. According to Detty and Yingling (2000), LM is a comprehensive philosophy for structuring, operating, controlling, managing and continuously improving industrial production systems [10]. Phillips (2004) asserted that the goal of LM is the reduction of wastes in human effort, inventory, time to market and manufacturing space, in order to become highly responsive to customer demand while producing world-class quality products in the most efficient and economical manner. There are seven types of wastes in LM systems: transportation, inventory, motion, delays, overproduction, over-processing, and defects [11].

Shah and Ward (2003) also indicated that LM is a multi-dimensional approach that encompasses a wide variety of management practices, including Just-In-Time, JIDOKA, Standardized work, Kaizen, team work, cellular manufacturing and supplier management [12]. Cook and Graser (2001) also maintained that LM is a broad collection of principles and practices that can improve corporate performance [13]. According to Creese (2000), LM is a manufacturing philosophy that shortens lead time and reduce costs via eliminating wastes (MUDA) yet improves quality, employee skills and job satisfaction [14].

Besides that, Nordin et al (2011) pointed out that the ultimate goal of LM is to create a smooth and high quality production to satisfy the customers’ demand [15].

2.2. Lean success indicators

Many factors indicate that lean intervention has been successfully adopted by Vietnam’s manufacturing organizations. From

the literature study, it is very clear that an important aim or objective of lean manufacturing is the continuous and sustainable elimination of waste resulting in a decline in lead times, and an increase in productivity, quality, and on-time delivery.

2.3. Critical success factors

Critical success factors (CSFs) are the limited number of factors in which satisfactory results will ensure successful competitive performance for individuals, departments or organizations. CSFs are those areas where “things must go right” for the business to flourish and attain the manager’s goals [16]. Critical success factors are very important in ensuring the successful implementation of LM and to avoid failure risks such as generation of losses to an organization’s cost, time and employee’s efforts [17]. The CSFs approach has been widely adopted and used in different research fields to determine key factors which are essential to the success of any program or technique. For example, Achanga et al (2006) classified four CSFs of lean in SMEs, namely leadership and management, skills and expertise, finance, and a culture of continuous improvement [18].

2.4. Critical success factors of LM implementation

Although, many companies have implemented LM tools and techniques, most of them are faced with challenges. These challenges could be avoided and overcome by identifying the CSFs of LM tools. In other words, there are many CSFs if identified and well understood that will support the

overcoming of these obstacles and difficulties [19]. Therefore, studying and understanding the CSFs of LM implementation is very essential. There are many papers published regarding the CSFs of LM and productivity improvement initiatives. Table 1 presents factors as indicated by different authors in previous researches.

Table 1 shows that there have been disagreements among the reviewed articles. Some factors were mentioned in most of the research (e.g.: top management commitment, culture change, training, communication...) while others were found in only one or two of the researches. This gap could be attributed, in the researcher’s opinion, to the sparse theoretical background that underpins the interpretation of how and why these factors guarantee successful implementation of the LM approach, since they were identified through a revision of the experience of some companies that have successfully implemented the LM approach. Therefore, the necessity of developing a theoretical framework has emerged, one that accounts for how and why these critical factors guarantee successful LM approach implementation. This framework should also include the critical implementation factors. This is because it may prove the validity of this framework to theoretically interpret the success of the implementation of the LM approach in each of the previous studies. Therefore, more probably a new theoretical model could help interpret the success of other cases in addition to the case companies of this current study. Also, such a framework may help in reducing the variation among these factors. The following part discusses these issues further.

Table 1: Synthesize critical success factors for LM implementation

| No | Critical Factors | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | (19) | (20) | (21) |
|----|-----------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|------|
| 1 | Top management commitment | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 2 | Clear goals and objectives | | X | | | X | X | | X | | X | | X | | | X | | | | | | X |
| 3 | Empower decision maker | | | | | | | X | | | | | | | | X | | | | | | X |
| 4 | Financial capability | X | | | | X | | | | | | | | | | X | | | | | | |
| 5 | Time allocation | | | | X | | | | | | | | | | | | | | | | | |
| 6 | Infrastructure | | X | | | | X | | X | | | | | | | | | | | | | |
| 7 | Culture change | X | X | | | X | X | | X | X | X | | | | | | | | | | | X |
| 8 | Behavior change | | | | | | | | | | | | | | | | | | | | | X |
| 9 | Effective communication | | X | X | | X | | X | X | | X | | X | | X | X | | | | | | X |
| 10 | Team work ability | | | | | | | | | X | | | X | X | X | X | | | | | | |
| 11 | Understand Lean tools | X | X | | | X | | | | | | | | | | | | | | | | X |
| 12 | Continuous improvement | | | | X | | | X | | | | | | X | | X | | | | | | X |
| 13 | Problem solving ability | | | | | | | | | | | | | | | | | | | | | X |
| 14 | Standardization | | | | | | | | | | | X | | | | | | | | | | X |
| 15 | Employee involvement | | X | | X | | | | X | | X | | | X | | X | | | | | | X |
| 16 | Training and education | | X | | | | | X | X | X | X | X | | | | X | | | | | | X |
| 17 | Reward and punishment | | | | | | | | | | | | | X | | X | | | | | | |
| 18 | Set up an evaluation system (KPI) | | X | X | X | X | | | | | | | | | X | X | | | | | | |
| 19 | Project presentation | | X | | | | | | X | | | | X | | | X | | | | | | |
| 20 | Expert consulting | | | | | | | | | | | | | | | | | | | | | |
| 21 | Flexible in implementation | | | | | | | | | | | | | | | | | | | | | X |
| 22 | Linking Lean to suppliers | | | | | | X | | X | | | X | | | | X | | | | | | |
| 23 | Linking Lean to customers | | X | | | | | X | X | | | X | | | | X | | | | | | |

Source: Summarized by author.

- (1) Achanga et al (2006) [18]; (2) Coronado and Antony (2002) [5]; (3) Yang, P. and Yuyu (2010) [20]; (4) Bakas Ottar et al (2011) [21]; (5) Goutam et al (2012) [22]; (6) Ibrahim Alhuraish et al (2014) [23]; (7) Rose et al (2014) [24]; (8) Kumar, M. et al (2015) [25]; (9) Tack-Wei Leong et al (2012) [26]; (10) Alaskari et al (2012) [27]; (11) Assrar Sabry (2014) [28]; (12) Fiona (2006) [29]; (13) Roslina et al (2011) [30]; (14) Mehmet Tolga Taner (2013) [31]; (15) Womack and Jones (1990) [9]; (16) Womack and Jones(2003) [1]; (17) Liker, J. K (2004) [32]; (18) Kumar, R. et al (2009) [33]; (19) Denis, P (2007) [34]; (20) Al Sarif (2011) [35]; (21) John Shook (2015) [36].

3. Research framework

In order to develop a theoretical framework that fulfills the aforementioned necessity, this researcher has looked into the literature that theoretically tackles the success of the LM approach. The researcher has found an attempt within the literature that may fulfill this necessity. This attempt was made by John Shook (2015), who explains the success of the transformation of the LM approach for enterprises [36]. In his transformation model, John Shook offered six key questions for lean transformation:

1. What are the leadership behavior and management systems that are required to support this new way of working?

2. What is the work that needs to be done?
3. What basic thinking, mindset or assumptions comprise the existing culture, and drive this transformation?
4. How can we start the work, and what situation problem do we need to address?
5. What employee involvement is required and how can we motivate our people?
6. What are the external factors that impact the work?

To answer the questions of lean transformation according to John Shook (2015), a framework will be developed for this research, as shown in Figure 1.

4. Research methodology

A qualitative method was conducted for this research. It produced findings without the use of statistical procedures [37]. Furthermore, the qualitative research provided insights and understanding “how” and “why” the factors affect the success of the LM implementation [38].

Since qualitative method was chosen for this research, a combination of techniques for collecting data was employed. It comprised a literature review, observations of companies’ practices, and interviewing key persons relating to LM implementation. The literature review was conducted extensively at the initial stages of the research, demonstrating the existence of gaps in terms of knowledge. The review did not provide sufficient information of the issues that affect companies’ successful implementation of LM. Therefore, there was a need for further research within the existing companies that had implemented the lean concept previously. The idea behind this move was to investigate further, so as to determine such factors which are deemed critical for lean implementation.

The data was collected from three lean manufacturing projects which have been implemented in companies. Main techniques used for data collection included participants’ observations and personal interviews. The information was then analyzed and used for the

preparation of the interviewing process. Personal interviews were conducted through semi-structured questionnaires. They involved a number of key personnel in the companies that include the general workforce of the concerned companies involved in lean projects.

In order to find out the perspectives of companies on the factors which are critical for LM, a number of questions were tailored to enable the extraction of ideas that give a true reflection of the interviewee’s perception of these factors. Preparing a number of questions that embodied a company’s definition of LM and whether that company had implemented lean manufacturing before. For example, the key questions in the semi-structured questionnaires were:

- What is your definition of LM?
- What has motivated the company to implement LM?
- How many people are involved in the exercise?
- What training if any, do the staff undertake?
- What are the difficulties and how did your team overcome them?
- What are the direct and indirect resources involved in the implementation of LM?
- What are the critical factors for successful implementation of LM? Why?

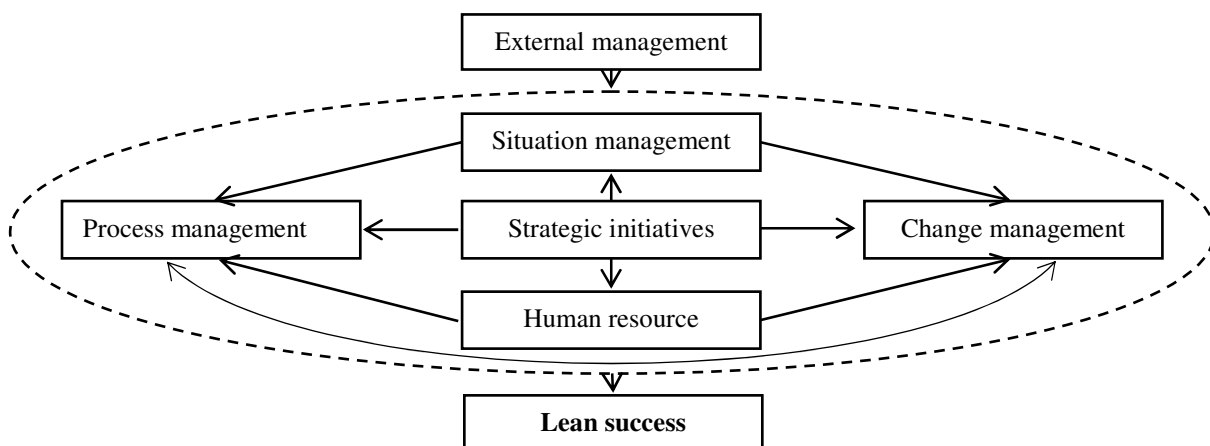


Figure 1: Research framework.

Source: Adapted from John Shook for this study, 2015.

5. Research results

5.1. Results background

A profile of three Lean projects and interviewees implemented in different cases is shown in Tables 2 and 3.

5.2. Success factors for LM implementation

Strategy initiatives: LM application typically begins with strategic initiatives from a senior management team. The most important factor is top management commitment and involvement. Top management commitment is considered in this company as the most important factor to initiate an LM approach. Almost all interviewees insisted that top management commitment is necessary for the

successful implementation of the LM approach, "... without this commitment, LM will not continue in any organization". In addition, there is a link between a top manager's acceptance and his support. So, the top manager said "they need to say yes, it is okay, and we are going to support people doing this". Similarly, some interviewees said: "We need to have top management's support" and "You must have a commitment right from the top of the company, from the managing director down to everyone". This reflects the claim Achanga et al. (2006) make that says the implementation of LM is often driven by the senior leadership. Organizations that are not able to secure a mandate from senior leadership will have a lot of difficulties when implementing LM.

Table 2: Lean project profile

| No | Project, Kaizen | Duration | Scope | Status | Result |
|----|--------------------------------------------|----------|---------|---------|-----------------------------------|
| 1 | Production efficiency improvement (Case 1) | 6 months | Company | Success | Increase efficiency 79% to 85% |
| 2 | Inventory reduction (Case 2) | 3 months | Company | Success | Reduce 94% of stock |
| 3 | Layout optimization (Case 3) | 3 months | Company | Success | Reduce 38% space, 42% moving time |

Table 3: Number of interviewees participated for study

| No | Project, Kaizen | Top management | Middle management | Front line employee |
|----|--------------------------------------------|----------------|-------------------|---------------------|
| 1 | Production efficiency improvement (Case 1) | 1- DGM | 2- MA, GL | 1- TL |
| 2 | Inventory reduction (Case 2) | 1- DGM | 2- MA, AM | 1- SL |
| 3 | Layout optimization (Case 3) | 2- DGM | 1- MA | X |

Note: DGM: Deputy General Manager, MA: Manager, AM: Assistant Manager, GL: Group Leader, TL: Team Leader, SL: Sub-leader.

Source: Summarized by author.

Change management: Change management involves effectively balancing forces in favor of a change over forces of resistance. Organizations, groups, and individuals resist

changes that they perceive would threaten them. It was suggested that corporate transformation requires a general dissatisfaction with the status quo by employees who have to change

(i.e. have a readiness to change), have a vision of the future, and where there is a well-managed change process. Revolutionary and evolutionary tactics for accomplishing change depend on the communication about the change and nature of the leadership. Thus, the pattern of change, management's readiness to change (i.e. being committed to it, participating in the process, or being resistant to it), the scope of the change, and the management of the change, are the key constructs in practicing change management.

Process management: Process management is defined as a set of concepts and practices aimed at better stewardship of business processes. Successful process management uses process measurement (e.g.: metrics, information capture, feedback loops...), tools and techniques and documentation (flow chart analysis, fishbone analysis...). Evidence also supports the use of team-based structures both for implementing the project and for designing the new processes. The companies in this study used successful formal techniques and process metrics for process management. These included: just in time, one piece flow, standard work, Kanban, Poka-yoke, and leveling.

Human resource management: Results from this study show that training and education is critical to ensure the success of LM implementation. Training programs should be available to all employees working at different managerial levels. They should be available to manufacturing and non-manufacturing groups as well as to managers and workers, leaders and followers. This widespread availability will help to reduce knowledge gaps among the managerial levels. As training programs are suggested to be made available for all employees, and because there are different levels of understanding, responsibilities and qualifications, there are three types of programs recommended. Namely, introductory courses,

lean tools program, and math and statistics courses. This variety is elaborated further in the following part.

Situation management: As LM is a project driven methodology, it is essential to prioritize projects which provide maximum financial benefits to the organization. The projects are selected in such a way that they are closely tied to the business goals or objectives of the organization. Therefore, every project should be selected so that it will help to improve competitive advantage, business profitability, and process cycle time. In a LM project, we have to answer an important question: "What problems are we trying to solve?" There are many criteria for project selection that try to measure the factors as described. To select a LM implementation project, we can use SMART goal method: Specific, Measurable, Achievable, Realistic, Time specific.

External management: Suppliers support is a critical factor for the successful implementation of LM. Companies need to share lean activities with the suppliers, who have a direct participation in the company's manufacturing deliveries. The traditional approach is to have different suppliers in order to maintain reduced costs, however under LM, one way to reduce cost is to have few suppliers and help suppliers optimize all activities in manufacturing and delivery. This is called the "pull system". Similarly, LM should begin and end with the customers. Projects should begin with the determination of customer requirements. It is essential to set project goals based on reducing the gap between the company's expected and actual performance, especially in term of delivery time, reliability and customer satisfaction. The understanding of markets, operations, and creativity to maximize value and performance are the core elements of the LM approach.

6. Conclusions

This research describes the realization of CSFs determining the successful implementation of LM in Vietnamese manufacturing enterprises. The framework of CSFs provides useful insights for the enhancement of the critical decision-making process that are needed for the strategy for LM application in organizations. In order to achieve the full potential of LM applications, it is important to take these factors into consideration. If any of these ingredients are missing during the implementation of LM projects, it would then be the difference between a successful implementation and a complete waste of effort, time and money. From this study, it is observed that the CSFs have positive impacts on different categories of performance, such as productivity, quality, delivery, and cost. Furthermore, different CSFs show different impacts on different performance criteria in different cases.

Although this research produced useful information and was conducted with a systematic process, there were several limitations. This study was conducted in limited cases through three LM projects. In companies, people are not very willing to provide useful and timely information and data for exploration. The next stage of the research is needed to deeply evaluate each factor in Vietnamese manufacturing enterprises to understand their level of importance. Future studies will also make an attempt to compare the difference ranking of the CSFs in various companies.

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