

(Skrudupaite and Obertas, 2011) ⁽¹⁴⁾	key factors of success in the management of Synchronized Production System implementation process:	<input checked="" type="checkbox"/> CSFs <input type="checkbox"/> CFFs	Business plan and vision; Top management support; Project management ; Change management, organizational culture; Effective communication; Education and training; Knowledge transfer, Skill and expertise; Organizational structure; Monitoring and evaluation of performance.
(Jagdishet al., 2013) ⁽¹⁵⁾	Barriers in Lean implementation	<input type="checkbox"/> CSFs <input checked="" type="checkbox"/> CFFs	Top management resistance Lack of top/senior management focus leadership Lack of top/senior management involvement Lack of communication between management and workers Lack of empowerment of employees Workers' resistance Lack of perseverance Lack of consultants and trainers in the field Lack of formal training for managers Lack of formal training for workers Cultural difference Lack of cooperation and mutual trust between management and employees Cross-functional conflicts Incompatibility of lean with the company bonus, rewards or incentives systems The lack of resources to invest Slow response to market Lack of information sharing or communication with suppliers and customers Lack of cooperation from suppliers Lack of influence over suppliers or lack of involvement of suppliers in the actual implementation Lack of supplier collaboration or lack of mutually beneficial strategic partnership with suppliers and customers Quality problems with supplied material Absence of a sound strategic action/logistical planning system Lack of logistic support Problems with machines and plant configuration
(Bortolotti et al.,2014) ⁽¹⁶⁾	CSFs for lean implementation	<input checked="" type="checkbox"/> CSFs <input type="checkbox"/> CFFs	Organizational culture; Adoption of soft practices.
(Dora et al., 2015) ⁽¹⁷⁾	Lean implementation in food-processing SMEs – a multiple case analysis	<input checked="" type="checkbox"/> CSFs <input type="checkbox"/> CFFs	Commitment of top management; Culture; Piecemeal approach; Training; Multifunctional team; Resource; Organizational structure; Remuneration; Change agent; Nature of the process; Nature of the product; Nature of the plant.
(Harrison et al., 2016) ⁽¹⁸⁾	Contextual characteristics that influenced the success of the Lean project in hospital systems	<input checked="" type="checkbox"/> CSFs <input type="checkbox"/> CFFs	Organizational factors: Resources; Structural location of Lean expertise; Existing quality improvement knowledge and skills IT infrastructure. Implementation process:

			Aligning Lean with organizational vision; Project oversight and support by senior leaders Project monitoring and feedback; Training. Context effects on monitoring results: Project planning; Characteristics of the team; Communication and intra-organizational dissemination.
(Antosz and Stadnicka, 2017) ⁽¹⁹⁾	Problem in Lean Manufacturing implementation in SMEs	<input type="checkbox"/> CSFs <input checked="" type="checkbox"/> CFFs	Lack of knowledge about Lean Manufacturing; Employees' resistance; Lack of employees' commitment; A lot of current work; Lack of top management commitment; Lack of financial means; Lack of motivation tools; Lack of top management support.

4.1 Analysis of Critical Success Factors

After having reviewed different critical factors (successes and failures) proposed by various researchers in the literature for Lean implementation in several areas (industrial, hospital, and others ...), In this section, we will identify the main critical success factors, which cover several aspects: organizational, cultural and operational aspects of the business. Firstly, we grouped these CSFs in order to avoid any redundancy and similitudes between them. In fact, the difficulty that faced the researcher during the CSFs' investigation was the use of different expressions by the authors for the same CSF.

Secondly, we measure the occurrence of each critical success factor already identified in the literature as below:

1. Top management support and commitment;
2. Project management and planning;
3. Change management and Organizational culture;
4. Skills and expertise;
5. Employee Attitude;
6. Effective communication at all levels;
7. Training and education;
8. Resources and capabilities;
9. Adoption of soft practices and good Lean tools;
10. Business plan and a clear vision;
11. Active, strategic and visionary leadership;
12. Project selection and prioritization;
13. Project monitoring and evaluation of performance;
14. Organizational structure ;
15. Alignment the project with the organizational vision;
16. Patience and long-term vision of results;
17. Information technology infrastructure ;
18. Link quality improvement to (employees, customers, businesses, suppliers);
19. Motivation ;
20. Involvement of various parts of the organization;
21. Customer Engagement ;
22. Belief in new programs ;
23. Estimation of implementation cost ;
24. The service is outcome /customer/stakeholder-oriented;
25. Wish for improvement ;

The result is then summarized in Figure 1, using a Pareto charts that make possible to visualize the main critical factors that need first attention in Lean implementation.

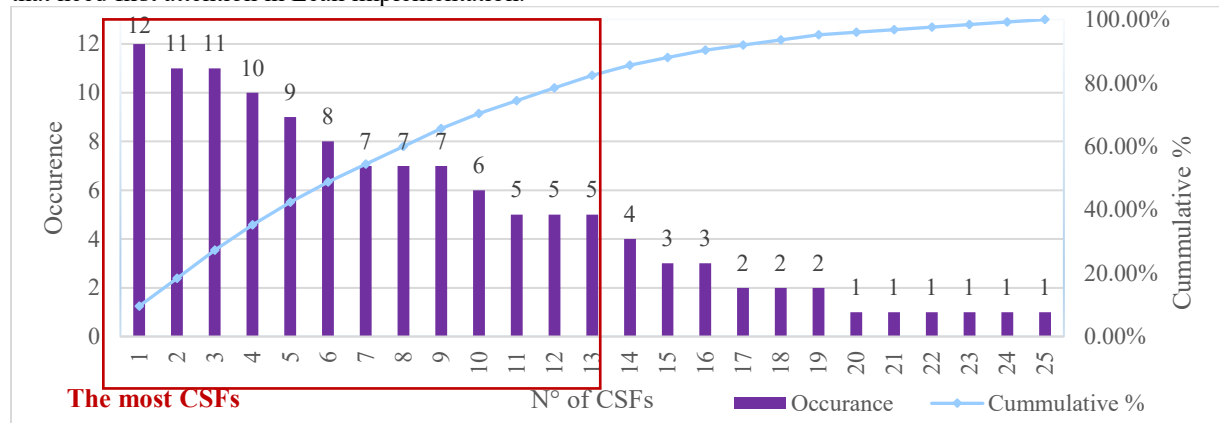


Figure 1. Pareto chart of CSFs for Lean Manufacturing implementation

Based on Pareto analysis as well as the literature review dealing with different types of companies, regardless of their activity sector, we have determined thirteen most important CSFs during the implementation of Lean Manufacturing. These factors are the most critical success factors that could be used especially in large firms. In fact, the primary adopters of Lean Manufacturing were large and multinational organizations, such as Toyota industries, and the critical factors that have been implemented since today were mainly focused on large firms. Consequently, using these factors into SMEs environment may not be adequate enough without taking into account the particularities of SMEs.

5. Projection of Critical Success Factors on SMEs

Small and medium sized Enterprises intend to implement Lean concept by the provision of resource as well as the willingness to learn and acquire new ideas and technologies for its corporate competitiveness (Achanga et al. 2006). For that, the study CSFs for Lean implementation in SMEs, should consider characteristics of small and medium companies especially that SMEs differ from larger companies. In order to solve this quandary, the main CSFs for Lean implementation those were determined according to the Pareto analysis previous section, will be discussed and analyzed by considering the different characteristics of SMEs. According to Von Axelson (2007), SMEs differ in three ways from larger companies:

- **Management:** SME management seems to be small and centralized. A short-range perspective makes it easy to be absorbed by details. SME managers have in general a high commitment but the management skills vary. However, the management in an SME is an important factor to consider in the implementation of new technology. Problems and obstacles occur if the management team does not participate in the implementation process.
- **Resources:** SMEs have limited resources, both financial and manpower. Small companies often need external support if they want to implement new methods, e.g. quality management.
- **Organization:** The organization in an SME is often flat and informal. The flat organization gives in general little bureaucracy, good overview and 2 rapid intuitive decision-making. A flat organization is also flexible which could make it easier to implement methods and to create an innovative climate, avoid bureaucracy and create a positive working climate with high motivation. With limited recourses and varying management skills it is hard to carry through long-term programs for organizational development.

The CSFs for Lean Manufacturing implementation within SMEs will be then classified on these three. The result is shown in Table 2.

Table2. Classification by categories of CSFs for lean implantation within SMEs

CSFs	Management	Resources	Organization
Top management support and commitment	X		X
Project management and planning	X		
Change management and Organizational culture	X		X
Skills and expertise	X	X	
Employee Attitude	X	X	
Effective communication at all levels	X		X
Training and education		X	
Resources and capabilities		X	
Adoption of soft practices and good Lean tools	X	X	
Business plan and a clear vision	X		X
Active, strategic and visionary leadership	X		
Project selection and prioritization	X		
Project monitoring and evaluation of performance	X	X	

6. Discussion

In this section, the CSFs for Lean implementation will be discussed in detail for each category characterizing SMEs.

6.1 Management

6.1.1 Project management and planning

The Project Management Institute (2000) defines a project as a temporary, definitive beginning and definitive end, endeavor undertaken to create a unique product or service. Projects can be considered as the achievement of a specific objective and involve the utilization of resources on a series of activities or tasks.

Project management and planning includes project champion, teamwork, project composition as well as the project planning that are used to deliver a result. This result is always a change in the organization, regardless of its processes, performance, products or services (Vidal et al. 2010). Also, all projects are based on four criteria: size, variety, interdependencies and contextual dependence (Vidal et al. 2010), considered as key elements in SMEs.

Project management and planning in a Lean Manufacturing project involves coordinating, planning and monitoring defined activities to ensure achievement of objectives. It includes the appropriate strategic alignment, effective planning and project management techniques as well as the appropriate use of the methodology and the redesign of the effective process. It is a crucial step when implementing Lean Manufacturing since it defines how the project is managed; by defining the objectives of the project and the units involved, scheduling projects, ensuring sufficient staff, and coordinating project activities with related work in other parts of the organization (Harrison et al. 2016).

Considering that the project planning is never finished until a project is completed. The planning can be reviewed on several times due to changes that can happen during project implementation. However, we should not omit the contribution of team members in project planning that could bring important improvements to the achievement of Lean implementation.

6.1.2 Active, strategic and visionary leadership

To implement Lean Manufacturing successfully within SMEs, the companies should have a strong and strategic leadership. According to the survey of Henry Johnson, an American management scientist, about 43% of respondents believe that the establishment of a strong leadership team is an important reason of the success of reform in enterprise (Jun-guo and Wei-xia 2006). In principle, strong leadership and management permeates a vision and strategy for generating (Achanga et al. 2006).

Considering that most Leaderships of SMEs are owner managers, they may not have the tactful management. Consequently, a large number of SMEs are hampered strategically due to a lack of quality strategic drives from good leadership traits (Achanga et al. 2006).

Leadership behavior and rewards are then too easily focused on the management of a continuous series of short-term crises, whilst the implementation of Lean Manufacturing that could create a firmer base for success by reducing costs and improving use of resources can be subject to continuous postponements “until better times” (Achanga et al. 2006). Therefore, the Leadership should manage carefully the implementation of Lean project in SMEs, since he must be strategic in his decision-making and a good visionary in order to solve the problems that may arise during the Lean implementation process.

6.1.3 Project selection and prioritization

Project selection is one of the critical factors in the success of any business change program, whether short-term or long-term. Identification of high-impact projects at the initial stage of a program will result in significant breakthroughs in a rapid timeframe (Noble 2004).

The project selection should be founded on the determination of the needs and objectives of the company. Thus, a prioritization of the implementation of Lean projects in SMEs is an important task for the management of the enterprise, since it can help to inculcate the Lean philosophy within the company, which will allow to adopt the philosophy by the different collaborators and consequently to apply it in their tasks. This will help to facilitate the implementation of other Lean tools that have not been applied, in order to reduce or eliminate all wastes that do not add value to the company.

6.2 Resources

6.2.1 Training & education;

One of the most important necessities is to build human capital by providing education and training to employees (Antony et al. 2012). Therefore, Lean implementation may not reach its intended purpose if there are inappropriate training methods and knowledge transfers (Cudney and Elrod 2010).

Lean Manufacturing is not complicated to understand but difficult to apply, since it is generally learned in the shop floor. The fact that SMEs don't have many employees such as Large firms, and if the staff doesn't have basics of Lean Manufacturing and tools necessary to work, it will make the task difficult for them as well as for other employees. Hence, the need to train them by explaining fundamentals of the Lean Manufacturing as well as to illustrate situations before practicing in the shop floor. This will allow employees of SMEs to change their attitude and behavior by adopting the values of Lean Manufacturing.

6.2.2 Resources & capabilities

Lack of resources (time, budget, etc.) is a big challenge for many organizations, particularly SMEs. It is the crucial factor to ensure the successful and effective implementation of any project. Considering that finance covers the avenues through which other useful provisions like consultancy and training can be made (Achanga et al. 2006), and

employees quite often do not get enough time to execute continuous improvement projects which result in improved process performance or increased customer satisfaction (Antony et al. 2012).

Therefore, some suppliers avoid implementing Lean because they believe that they do not have time for training or financial resources to hire consultants, as well as to aid the actual implementation of such ideas. The training also requires financial resources. In some cases, manufacturing activities may be ceased temporarily in order to allow to workforce to get such knowledge; a fact that SMEs view as an unnecessary loss of resources, more especially if they do not anticipate immediate returns (Tracy 2007 and Achanga et al. 2006).

6.3 Management – Organization

6.3.1 Top management support & commitment

Top management support & commitment has been widely recognized as managerial and organizational factors, especially in SMEs. If there is no top management support, there will be no investment decision. Therefore, the implementation of Lean project cannot be achieved. Without the commitment of top management, the system cannot go very far. Management must be visibly supportive in SME's.

A failure to commit results in lack of attendance at executive meetings and events, partial engagement in the whole change process and a visible reluctance to implement the ideas put forward by staff members after the completion of projects (Antony et al. 2012).

6.3.2 Change management & Organizational culture

The creation of a supportive organizational culture is an essential platform for the implementation of Lean Manufacturing (Achanga et al. 2006).

Organizations are often made up of top management and employees with different personalities and goals, so each one of them have a distinct culture. In order to survive, organization and their cultures must continuously evolve and change. In addition, three essential elements can affect organizational change, which are: beliefs, diversity of employee and leadership behavior that can facilitate or inhibit change in the organization.

The investigation of Achanga et al. (2006) has clearly indicated that it is highly desirable to have some degree of communication skills, long-term focus and strategic team while intending to implement any new initiative. Most large organizations are conscious of this, regardless of their choice of cultural models or success in using them, but many SMEs by default, reflect in their culture the personality of the owner/manager and are constrained by this in terms of the changes they may be able to undertake (Achanga et al. 2006).

6.3.3 Effective communication at all levels;

Communication is exchanging as well as sharing ideas and information between the different employees of the company; in order to achieve the desired objectives in the short, medium and long-term, by collaborating and coordinating all the actors of the organization. Effective communication at all levels allows engagement and involvement of the staff concerned. Employees need to be properly informed on the changes that are being implemented (Cudney and Elrod 2010). It is among the most important successful factor for high efficiency, commitment, increased productivity and team spirit, especially in SMEs.

According to Scherrer-Rathje et al. (2009) the lack of team autonomy as well as organizational communication and interest in lean led to the termination of the lean project.

6.3.4 Business plan and a clear vision;

The first phase of any project should begin with a conceptualization of objectives and the means to achieve it. Clear goals and objectives seem to form a clear critical success factor in SMEs, but may be, in fact, rather problematic. Indeed, at the beginning of a Lean Manufacturing project, it is often very difficult to determine them.

6.4 Management - Resources

6.4.1 Skills and expertise

The insufficient of financial resources impact the SMEs strategic framework, hampering critical success factors such as skills and expertise. The future of manufacturing lies in the use of intellectual capital and ability to innovate and differentiate (Achanga et al. 2006).

Most SMEs employ people with low skill levels, and they do not foster the ideology of skill enhancement. Moreover, low level employee skills would not harness the desire for technology development (Achanga et al. 2006).

6.4.2 Employee attitude

Human resources management is the key of success in any business, specifically in SMEs, if it is considered as the main factor after the commitment of Leadership and top management. Besides, human resources are crucial to Lean implementation since employees are often the main element in operations. This critical success factor includes several aspects of employees, namely: employee engagement, participation, teamwork and resistance to change.

The first thing to consider in human resources management is the resistance to change. In fact, managers who wish to introduce a new philosophy or approach into their businesses, especially in SMEs, need to take into account the

resistance to change by employee that usually comes from the fact that some positions may be eliminated because they are considered as ones of the no add values activities.

According to Womack et al. (1990) and Cheng et al. (2011), Lean philosophy or culture should be shared by employees across the entire organization. So, ample supports and active involvement reaching from top management to individual employees are crucial to the success of Lean implementation, as a result, the involvement of employees will be converted through teamwork, that is vital to the implementation and sustainability of any improvement initiative (Cheng et al. 2011, Sureshchandar et al. 2001)

Companies need to create regular Lean training opportunities which enable employees to have up-to-date knowledge and respond faster to changes in products and processes (Womack et al. 1990), subsequently, it will help them to develop autonomy to make quick decisions and undertake business process change.

6.4.3 Adoption of soft practices and good Lean tools

A good selection of tools is a crucial step when implementing any philosophy, especially Lean Manufacturing which has a multitude of tools, the reason why we must choose the right tools for SMEs. Knowing that, implementing soft practices, i.e., small group problem solving, customer involvement and continuous improvement is considered as a distinctive characteristic of successful Lean plants, since soft practices are related to principles, managerial concepts, people and relations, which are more likely influenced by potential deviations from the ideal organizational culture for Lean implementation (Bortolotti et al. 2014)

Soft practices help create the appropriate environment for implementing hard Lean tools, by educating managers, employees, customers and suppliers about the importance of changing the production system according to a Lean perspective (Bortolotti et al. 2014)

6.4.4 Project monitoring and evaluation of performance

The development of a performance measurement system is essential when implementing any system, since it allows you to measure the performance of the system during and after its implementation. The enterprise can identify what to improve and how its limited resources can be used for this improvement.

Performance measurement also has an important communication role to play, by making people aware of what is important to the organization's success and the areas that the organization needs to improve (Gopal 2002). Additionally, performance measurement can induce success by encouraging and rewarding the appropriate attitudes and behaviors and by making the degree of progress prominent (Gopal 2002).

The challenge is choosing the right measures for the appropriate level of the organization (Booth 1996). However, the real benefits of Lean are difficult to quantify, since that Lean Manufacturing improve several aspects measurable and other unmeasurable. The establishment of a performance measurement system during the implementation of a Lean Manufacturing project within SMEs is a key to the success of the project since the measurement of the performance of the process makes it possible to ensure tracks of research and improvements.

The measurement system requires the intervention of the management of the company to manage the system and these various interventions as well as these resources to ensure use of necessary tools for the performance measurement.

7. Conclusion

Lean Manufacturing remains a philosophy that is recognized worldwide thanks to the elimination of wastes in processes (for example: too much stock of finished products, too much production waste), in order to increase the production capacity, while reducing costs and production cycle time. That is why many companies implement it, but it is not always a success and can lead to failure if the implementation is not well studied.

It is in this context, this paper has reviewed the literature of different articles dealing with the implementation of Lean Manufacturing in several firms from different sectors (food, industry, aerospace, automobile...) and categories (SMEs, Large companies), which allowed us to extract a multitude of critical success factors necessary for the implementation of Lean Manufacturing in any organization, which we summarized later in twenty five CSFs.

Subsequently, we calculated the occurrence of each factor identified in the literature and established a Pareto chart in order to obtain the most important CSFs during the implementation of Lean Manufacturing, which were summarized in thirteen CSFs. Those factors were then analyzing in the SMEs environment and classifying them according to three main categories that distinguish SMEs from Large Enterprises (Organization, Resources, and Management).

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