



## LEAN-TEAMS CHARACTERIZATION

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### Abstract

Currently, most organizations recognise the importance of teamwork as an organizational mechanism that improves the work environment, favouring the internal communication, the integration of new members, the motivation of workers and the transmission of the organizational culture and value. In Lean management, the design of work is characterized by cooperation and the resolution of problems in group. Effective teamwork is essential for successful Lean organizations because work teams are effective in improving processes and solving problems. The objective of this work is to identify the characteristics that work teams have within Lean organizations and those factors that are key to their success, intending to have references for management in this type of production system. Different types of work teams coexist in Lean with a series of specific objectives and characteristics. This qualitative study allows identifying the characteristics of Lean-teams and is the basis for confirming the effectiveness factors of the teams in the Lean environment.

**Keywords:** *Teams, Lean system, Effectiveness.*

## 1. INTRODUCTION

Teamwork is considered one of the most effective tools for the achievement of objectives when the task to be performed is complex in any area, sector or activity. It requires knowledge, skills, creativity and commitment of the whole team to achieve the objective (Jaca et al., 2012).

We find teams work not only in production systems but also in the development of new products and/or processes, in quality committees, quality control circles, continuous improvement and also adhoc teams to develop specific projects. Teamwork organization is used in all type of companies from industrial to service types.

In the context of dynamic and competitive environments, an efficiency-oriented management model is born, known as Lean Management (LM), which aims to address the “waste” that occurs within the value chain of companies, generating long-term benefits and improved profitability and sustainability. Lean is a term used to describe a system that achieves more with fewer resources, through the continuous and uninterrupted elimination of activities that do not add value to the service or product and teamwork plays a very important role in this effort (Shah and Ward, 2007).

Lean management is based on a series of principles, which require technical and human resources, which requires the involvement of work teams to carry out different tasks.

The objective of this work is to identify the characteristics that work teams have within considered in previous literature in Lean organization and those factors that are key to their success. Its relevance is based on intending to have references for managing this type of production system.

## 2. LEAN SYSTEMS

Lean Management is a sociotechnical management system that aims to eliminate any source of waste by simultaneous reduction or minimisation for internal and external variability generated in transactions with customers and suppliers (Shah & Ward, 2007). Lean extends beyond in-house production including other functional areas such as marketing, finance and accounting, covering relationships with customers and suppliers (Womack and Jones, 1996). It has even been extended to the field of the services sector (Emiliani, 2006; Swank, 2003).

Lean principles were codified by Womack and Jones (1996) around five ideas that include concepts aimed at delivering value to customers. Those principles are, firstly, specify precisely what is it about a product that creates value from the customer's perspective; secondly, identify,

study and improve the current value of the process for each product; thirdly, ensure the flow of a process simple, uniform and free of errors, thereby avoiding **waste**; fourthly, produce only what the required client; and finally, strive for perfection, which implies a continuous improvement of all the processes.

Lean management establishes eight different types of waste. Seven occur both in the manufacture of the product and in the phases of design and development of new products, order management and the rest of the stages of the value chain. These seven types of waste are overproduction, defective products, unnecessary inventory, excessive transport, unnecessary movements, inappropriate processing, waiting and queuing, designing products and services that do not respond to the needs of customers. One more type of waste completes the list, the eighth, that reinforces the previous ones (Womack and Jones, 1996).

Two types of resources are characteristics of Lean management: firstly, the resources related to the tools and practices that constitute the technical resources, the hard part, and secondly, the human resources which form the soft part, that have to put into practice lean principles and try to avoid the different waste types.

Relate to the human resources, there are a series of **elements** that will facilitate a successful result in Lean such as team working, staff training, remuneration and reward systems in Lean, rewards programme, multifunctionality and flexibility, and continuous improvement by teamworking (Uhrin et al., 2017). About the soft **resources** in Lean management, the design of work is characterized by cooperation and the resolution of problems in group. Small teams of people are used to solve problems and the opinions and ideas of team members are encouraged to solve even their internal team problems.

### **3. WORKING TEAMS IN LEAN MANAGEMENT**

There are many definitions for the concept of work team. In this study, and based on the common aspects of the definitions reviewed in the literature, we will consider the work team as a set of interdependent people who, during a limited period, interact with each other in a coordinated way, sharing a social identity, with a common purpose or objective

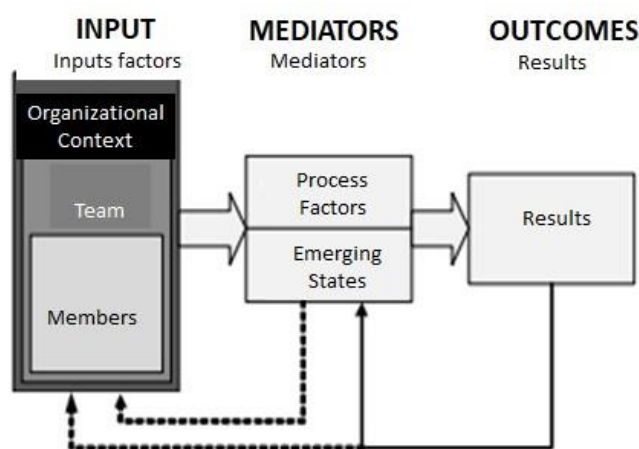
The teamwork is recognised in both manufacturing and services industries (Delarue et al, 2008; Fernández et al, 2006) as a means of increasing the competitiveness of the organization and as an organisational system that improves work environment favouring the internal communication, the integration of new members, the motivation of the workers and the

transmission of the culture and values of the organization. Also, the work teams are effective in improving processes and solving problems (Forza, 1996).

The most prominent feature of the organization of work in lean production is the extensive use of multifunctional teams where employees can perform different tasks (Karlsson & Ahlström, 1996). The percentage of employees working in multifunctional teams is much higher than in traditional work organizations. Consequently, effective teamwork is essential for successful Lean organizations.

Effective teamwork is essential for successful Lean organizations (Powell, 2011). The most common frameworks used to study team performance have their origins in the IPO model (input-process-output). The original Input-Process-Output (IPO) model was developed by McGrath (1964). This model identifies the composition, structure and processes of the team as the key background of the effectiveness of the equipment. The team is described in terms of a system that transforms the inputs into measurable results. Lately, some other effectiveness models have been proposed, like Cohen and Bailey (1997) where the effectiveness of the team is based on three main dimensions: performance, attitudes and behaviour of the team.

The most contemporary framework to study the effectiveness of the team is known as the input-mediator-output-input (IMOI) model of Ilgen (2006) adapted by Mathieu et al. (2008) (Figure 1). Kozlowski and Ilgen's (2006) model considers teams as multilevel systems, including individual, team and organizational level. Teams are oriented to the task through cyclical and feedback processes. This model recognizes that several factors influence the results and it also highlights that team performance is developed over time and in a cyclical way, where the results become entries influencing future episodes.



**Figure 1.-** IMOI model for the effectiveness of teamwork (Ilgen, 2006; Mathieu et al, 2008)

This model recognizes that several factors mediate the influence on the results and also highlights that the team's performance develops over time and is cyclical, where the results of some returns become inputs that will influence future episodes. The work of the production teams can be seen as a series of related IPO cycles or also called “episodes” composed of phases of action and transition that accumulate performance by receiving feedback and interpersonal relationships.

The IMO model represents the cyclical character of the processes carried out by the teams through feedback loops. The solid lines in figure 1 suggest that the results have a major influence on the processes and emerging states. The dotted lines indicate that the influence on the Inputs is smaller, as it is more difficult to change the structure and team composition as well as the organisational context. In this model, Ilgen (2006) with this model considers teams oriented to the relevant processes for the task that evolve, so that both processes such as team effectiveness constitute emergent phenomena like patterns resulting from regular and repeated interaction between members.

#### **4. RESEARCH METHODOLOGY**

Following Tranfield et. al (2003) this study conducted a systematic literature review through three phases. In the first research phase, we considered the bibliographic databases available. Scopus and Emerald data are the ones we used most, defining the topic in short sentences and identifying keywords. “Lean” and “Team” were the main phrases used in the literature search. In the second phase, organization and classification phase, we ordered and classified the material collected in a unique document using a summary form: year, authors, keywords, abstract, objective, hypothesis, methodology, conclusions, limitations and future lines. In the third phase, reading and writing, we synthesized ideas and joined the contributions from different authors.

Keywords and combinations used for searches included different terms. Table 1 shows the diverse systematic searches selected with different combinations of the keywords related to the topic of interest, selecting the area of Business, Management and Accounting. The table includes the number of published articles found in this search from 2010 to 2019. Some references linked with other references that although they were older are very important to consider in this study. As mentioned, these references have been classified in a summary document. Based on the articles in this literature review, the content of the theoretical and conceptual framework of the study has been completed, as well as the specific factors of the work team have been extracted.

**Table 1.-** Number of articles related to the keywords

Business, Management and Accounting subject area	From 2010 to 2019
"Lean" + "Team"	236
"Lean"+"Team"+ "success factors"	20
"Lean" + "Team" + "critical success factors"	19
"Lean"+ "Team"+"Kaizen"	25
"Lean"+"Team"+"continuous improvement"	41
"Lean" + "Team" + "Effectiveness"	23
"Lean" + "Team" + "Effectiveness model"	1
"Lean" + "Teamwork"	39
"Lean" + "Team work"	19
"Lean-Team"	8
"Lean"+ "Work team"	10
"Lean"+"Teamworking"	4

## 5. RESULTS

### 5.1. Typology of Teams in Lean Management

Different work teams are identified in Lean systems with objectives and characteristics specific. On the one hand, frontline operators in Lean systems tend to be structured as small teams of three to six people and a team leader (Liker, 2004). The team is in charge of a work cell, or more generally, of a value stream "cycle", i.e., a set of tightly integrated activities whose work is extracted from the downstream and which in turn extracts components and raw materials from the upstream suppliers or processes. Measures of the effectiveness of such equipment are increasingly focused on speed, efficiency and cost/waste reduction.

Powell (2011) argues that teams play a critical role in lean manufacturing because it is based on cellularity. *Cellular manufacturing* is a form of team based on technology in which different machines, equipment or processes are placed together to produce similar products (families of parts) in similar processes using small, multifunctional and interdependent teams. In other words, a customised '*work cell*' is a logically and strategically located unit of work used for the manufacture of a particular product or a range of similar products

One of the factors affecting the implementation of cell manufacturing is the involvement of the employee in the cell design process (Powell, 2011). In addition to contributing to the activities of managing, operating and maintaining the cell, significant collaboration is required

in design and development activities. Whether the employee can work on a cell voluntarily or chosen by management may have a different impact on the success of the cell, although there is not enough research to support this hypothesis.

Teams members are multifunctional and interdependent. Cellular manufacturing requires human resources with a high level of technical skills and flexibility (multifunctionality) and also the ability to work effectively and interdependently in teams (interdependence) to achieve high levels of efficiency. It is now widely accepted that the successful implementation and maintenance of team-based cell manufacturing depends on both technical and social aspects (Powell, 2011).

On the other hand, in Lean systems, there are also teams called "*quality circles*" (Shingo and Dillon, 1989) and "*Kaizen groups*", which include people who work separately. In quality circles, members may be from different teams or areas. Interpersonal skills are critical to the success of these teams. Bidanda et al. (2005) found that the ability to co-communicate is the most valued of human issues. These teams are assigned functions such as quality control, maintenance, and to a lesser extent, work planning. "*Kaizen groups*" are improvement teams that are properly formed and temporarily dedicated to analyzing a particular problem (Malloch, 1997). This ad hoc group of participants is also known as "*kaizen workshops*" (Liker, 2004). In this sense, the work teams play a fundamental role in designing and maintaining the results in the improvement of the processes.

Schuring (1996) also distinguishes a workgroup design with standard operating procedures such as those found in lean production cells and other decentralized workgroup designs that are oriented towards problem-solving. These empowered teams are operationally autonomous and function without external intervention.

In the context of quality circles and kaizen groups, the concept of multiskilling implies flexibility, adaptability and provides team members with an overview of the work to be done that facilitates learning and continuous improvement. Training is necessary for new areas, although it requires a lot of time (Olivella, 2008).

Improvement teams (kaizen) are understood as interdepartmental and multi-level working teams that meet to define process improvement initiatives. The term improvement teams (kaizen) is used within the framework of Continuous Improvement to designate teams whose objective is the improvement of processes or the resolution of specific problems, which can work directly on the improvement of productive processes, or of any area of the organization.

In these improvement teams, participation requires few levels of management, functions are delegated to them whenever possible, and both teams and workers must be trained (Ahlstrom and Karlsson, 2000).

The combination of teamwork and continuous improvement within Lean systems requires prior education, preparation and training in teamwork competence (Robertson et al, 2015)

According to Delbridge (2000), the definition of a “*Lean team*” is based on the presence of a formally recognized, hierarchically distinct team leader who is part of the team and whose functions include some element of direct work that controls a maximum of 20 workers. Authors such as Benders and van Hootegeem (1999) and Biazzo and Panizzolo (2000) consider that in Lean systems, work is done in teams involved to solve problems in groups with standardization and a high level of discipline.

Following Cuatrecasas and Olivella (2008), the expression “*Lean team*” or “*Lean-Team*” is used referring to or to denote teams with characteristics such as task rotation, autonomous quality control and standardization of rhythms and methods although it is used in many different contexts. They encourage participatory work and standardization but can discourage workers from scrupulously following work guidelines under strict control (Olivella, 2008).

Gilson et al (2005) found that standardization and creativity can be complementary. In Lean teams, leadership is participatory, but autonomy is limited. Management assigns members to each team and teams are assigned strictly defined tasks (Dankbaar, 1997; van Amelsvoort and Benders, 1996).

It can be seen that teams undoubtedly play an important role within lean systems and appear simultaneously in their different forms: structured work cells associated with product or process lines, quality circles to address specific quality problems given the close relationship between lean systems and quality management, and cross-functional kaizen improvement teams.

Finally, it is verified that recently in the revised literature more concrete of Lean appears the concept *Team-Lean* as terminology that includes and summarizes the different groups of teamwork that are given within this environment.

## **5.2. IMOJ Effectiveness Model in Lean-Teams**

Few studies have analysed the application of the IMOJ Effectiveness Model in real organizations (Mathieu et al, 2008). Similarly, there is research on the effectiveness of the work



team in general but additional research is required to explore the factors of teamwork within the specific Lean production environment and in different business contexts. The model considers three types of factors, inputs, mediators and outcomes, classified in three levels, organizational context, teams level and individual members level. Figure 2 shows the IMO model adapted to Lean context where the characteristics of teamwork in Lean that influence its effectiveness are studied.

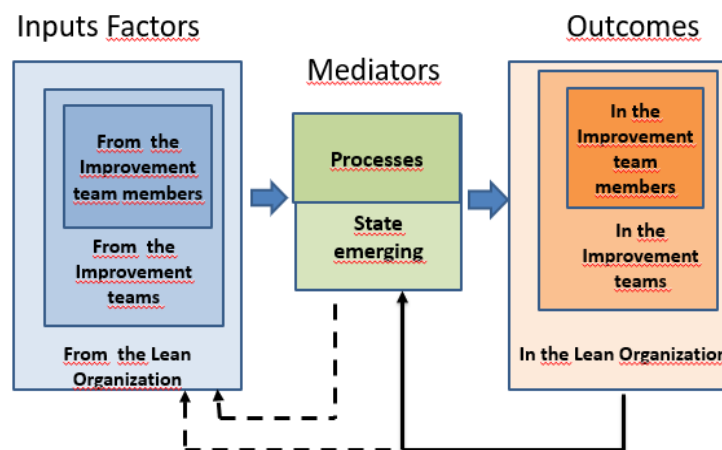


Figure 2. - Mathieu et al. (2008) model adapted to Lean Systems

Based on the literature reviewed, we consider as inputs factors in the context of the Lean organization, the support and managerial, training systems, compensation and rewards, executive leadership, communication and active listening. In the same way, from the Lean Teams autonomy, polyvalence, experience, heterogeneity, leadership, commitment, size, training, norms and roles are considered. In relation to teams' members, the time they know each other knowledge, skills and abilities are very important. The mediating factors participate through two types factors, Lean processes (participation, decision making and communication) and State emerging (team learning, empowerment, autonomy and leadership). Finally, Outcomes in Lean Systems (satisfaction), results in Lean teams (learning performance, continuous improvement) and outputs in Lean organization (achievement of objectives) (Figure 3).

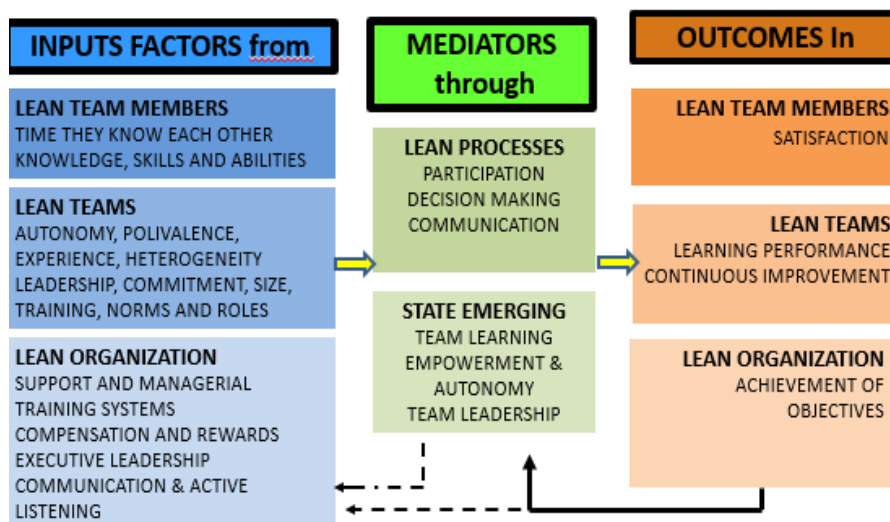


Figure 3.- Success factors effectiveness in Lean

## 6. CONTRIBUTION AND FUTURE RESEARCH

The contribution of this study is analysing the characteristics that work teams have within Lean organizations and the factors that have been considered as a key factor influencing their success. This qualitative study allows identifying the characteristics of Lean-teams and it is the basis for confirming the effectiveness factors of the teams in the Lean environment.

Future research should study the influence of the factors identified on lean team effectiveness that have not been previously considered. The research design could be based on a multiple case study initially. Information about their lean teams could be gathered through members interviews, focus groups, and observation of the production plant. This qualitative study would allow to identify Lean teams' characteristics and will be the base to confirm the teams' effectiveness factors in a Lean environment in a quantitative study with a larger sample of firms.

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