

# Lean production system development through leadership practices

Jose Carlos Toledo

*Department of Production Engineering, Universidade Federal de Sao Carlos, Sao Carlos, Brazil*

Rodrigo Valio Dominguez Gonzalez

*School of Applied Science, University of Campinas, Campinas, Brazil, and*

Fabiane Letícia Lizarelli and Renato Arima Pelegrino

*Department of Production Engineering, Universidade Federal de Sao Carlos, Sao Carlos, Brazil*

## Abstract

**Purpose** – Although lean methods are considered easy to be implemented during the initial phases of the lean transformation process, few companies are able to maintain them in long term. One of the key factors for this maintenance is the role played by the leaders in their teams. The purpose of this paper is to show the outcomes of an action research that analyzed and developed leadership practices, using the lean leadership model for developing people as reference and considering the factors: to promote employees' self-development; to coach and develop employees; to support daily *kaizen*; to create vision and align goal.

**Design/methodology/approach** – The results of this study are based on the action research method applied in a large Brazilian industrial company. The study was structured considering the phases of problem diagnosis, action plan, implementation and evaluation of practical and theoretical results.

**Findings** – The leadership practices implemented from the model were shown to be adequate to the lean production system (LPS) and it was observed that reflecting on the processes and the organizational learning are two main concepts that these practices support in the organization.

**Research limitations/implications** – Since this study is based on action research in a single company, the generalization of results is limited. Suggestions for future research include the development of a quantitative research in different industrial contexts.

**Practical implications** – The practical implications of this research are to present activities that must be developed by the leadership of organizations to maintain LPS.

**Originality/value** – This paper raises the problems of organizational leadership that limit the implementation and maintenance of LPS, presenting the planning and implementation of changes in leadership practices to solve these problems.

**Keywords** Continuous improvement, Leadership practices, Action research, Lean production system, Lean leadership

**Paper type** Case study

## 1. Introduction

Continuous improvement has become a premise for the maintenance of competitiveness and it is connected to different models, the lean production system (LPS) is one of them. The LPS implementation implies not only the adoption of the methods, its success requires from leaders of all organizational levels to change their mindset and behavior, and to systematically align the philosophy and tools to the organization's strategic objectives, vision and values (Mann, 2009; Aij and Rapsaniotis, 2017). The behavior must be directed toward the continuous improvement, cause and effect analysis and respect to people, i.e., toward the lean thinking (Flumerfelt *et al.*, 2016).

Poksinska *et al.* (2013) argued that, although the lean methods are easy to be implemented, few companies manage to become true lean companies, i.e., they show good initial outcomes and fail in the long-term maintenance. Mann (2009) considers leadership as



the “missing link” in lean practice, the tools are only a part of the transformation process, efforts to change practices, behavior and the leaders’ mindset are essential.

When properly applied, lean methods result on the company’s ability to create knowledge and learning (Emiliani, 1998), which demands trust-based behaviors, responsibility sharing and being open to experimentation without fearing failures (Senge, 2008; Emiliani, 2008; Aij and Rapsaniotis, 2017). A lean company requires differential management, especially in the way leaders act, interact and communicate with teams, as well as on how decisions are made, requiring open communication, trust and cooperation development (Emiliani, 2003; Liker, 2005; Assen, 2016).

Spear (2004) argues that the importance of the leadership role on the lean transformation process is under increasing recognition. Employees of lean companies, when effectively implemented, behave influenced by the leaders’ values and the leaders are seen as guides of the behavior of the teams (Inamizu *et al.*, 2014; Poksinska *et al.*, 2013; Canato *et al.*, 2013; Van Dun and Wilderom, 2016).

In addition the leader’s importance as a guide to other employees, Dombrowski and Mielke (2013), Dombrowski and Mielke (2014) and Bamford *et al.* (2015) highlight that the maintenance of the initial results of LPS is achieved through the dissemination of values by leaderships. The adoption of lean methods can bring results in waste reduction, however, the continuity and maintenance of improvements, and the creation of an improvement culture are achieved through practices that encourage learning, knowledge sharing and a sense of cooperation among employees, and for such, lean leadership is critical (Assen, 2016; Flumerfelt *et al.*, 2016; Van Dun and Wilderom, 2016).

The literature on the theme recognizes the importance of leadership and the propagation of its values to obtain results and maintain the lean approach. However, there is a gap in the literature regarding the observation of practices that guide leadership into a lean thinking. Liker and Convis (2013) and Dombrowski and Mielke (2013) suggested guiding models for leadership practices to consolidate the lean mindset through team development. Through action research in a manufacturing company, this paper shows the results of a study on the implementation and analysis of leadership practices that promote the maintenance of lean approach, using the suggestions of these authors as the basis.

## 2. Leadership in the LPS

For Dombrowski and Mielke (2013), one of the key factors for maintaining the lean transformation in a company is centered on the role played by leadership. Leadership is especially important when organizations experience changes, which is inevitable when implementing a lean system (Aij *et al.*, 2015). Leadership can be defined as a process that involves the action of influencing people in a group context to reach goals (Groves, 2016; Poksinska *et al.*, 2013).

One of the bases of the LPS is teamwork in the production line or on the shop-floor and, the team/ group leader has an important role for the teamwork (Fujimoto, 1999; Inamizu *et al.*, 2014). Fujimoto (1999) stresses the importance of the role of team leaders in LPS for process improvement when compared to the roles of leaders in conventional manufacturing systems. The leader should take care of team members and should also be concerned about team training (Monden, 2011). The group leaders and team leaders tend to become prouder of their job as their tasks shift from day-to-day troubleshooting to more constructive work such as *kaizen*, supervising and training (Fujimoto, 1999).

The literature on lean leadership considers that the leading style is associated to transformational and servant leaders (Poksinska *et al.*, 2013; Assen, 2016; Aij and Rapsaniotis, 2017). Transformational leaders are defined by their capacity of influencing values, attitudes, beliefs and behaviors in their followers to achieve the company’s goals (Pawar, 2003; Groves, 2016; Assen 2016). Servant leaders do not see the employees

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as followers, but as equals, increasing the individuals' satisfaction level. This kind of leadership is based on understanding the individuals' abilities, needs, desires, goals and potentials (Liden *et al.*, 2008; Assen, 2016).

Analyzing the theoretical backgrounds, Aij and Rapsaniotis (2017) identified an overlap between the servant and lean leadership styles, a specific coaching style is used in both models, although there are differences in the origins, philosophy, characteristics, behaviors and tools. Emiliani (2003) associates the lean leadership to the transformational leadership skills, in which the path to the skill building is related to the direct observation and participation in continuous improvement. For Poksinska *et al.* (2013), the lean leadership style is between the transformational and servant styles, since, as the employees' abilities evolve into lean practices, the leadership style changes from the transformational to the servant.

Lean leadership can be understood as a system for the implementation, maintenance and continuous improvement of the LPS (Dombrowski and Mielke, 2013), or as a set of leadership skills, practices and behaviors to successfully implement the system (Poksinska *et al.*, 2013). This leadership requires the development of new skills, turning the leader into a coach that helps individuals to develop new skills (Groves, 2016; Aij and Rapsaniotis, 2017).

Emiliani and Stec (2004) highlight the importance of leadership beliefs, behaviors and competences. Tools like the current and future value stream map helps the leadership focus on reducing lead time, improve quality, customer satisfaction, productivity and time-based competitiveness, which causes the change of behaviors, beliefs and competences, moving the entire organization toward lean vision (Emiliani and Stec, 2004).

Lean leaders encourage employees to take part in the creation and implementation of ideas, encouraging honesty, sincerity and teamwork (Van Dun *et al.*, 2016; Toma and Naruo, 2017). Table I summarizes these characteristics.

Liker and Convis (2013) suggested the diamond model to support employees' development in the LPS, describing lean leadership practices from four factors: to promote employees' self-development; to coach and develop employees; to support daily *kaizen*; to create vision and align goal.

The continuous practice of these four factors, improved by the PDCA(plan, do, check and action) cycle, promotes the gathering and internalization of knowledge and abilities of "lean competence." Lean competence consists on the sum of all lean values, principles and methods, represented by the employees' knowledge, abilities and attitudes, that, when added to resources and opportunities made available by the company, promote the improvement of operational performance (Schwartz *et al.*, 2012).

The "employee self-development" factor is related to the development of people, empowerment and trust building (Assen, 2016; Aij and Rapsaniotis, 2017), it begins with the learning process, which can be associated to the Japanese teaching model known as *kata* (Rother, 2010). The *kata* is represented by a learning cycle comprised by three stages: *Shu*, *Ha* and *Ri* (Espartero *et al.*, 2011), which represent three stages in the apprentice development and the levels of involvement with the instructor.

In the *Shu* stage, which means "protection," the apprentice seeks to reproduce the techniques as he was taught, while carefully observed by the master. This phase lasts until the techniques are reproduced as taught, and the apprentice performs them without needing guidance (Liker and Convis, 2013). In the *Ha* stage, which means "cutting ties," the goal is to make the apprentice reflect on the meaning of each technique, deeply comprehending them but strictly following the patterns (Liker and Convis, 2013). In the *Ri*, translated as "freedom to create," the apprentice goes beyond what he/she was taught, i.e., developing his/her own understanding and improving what he/she has learnt (Liker and Convis, 2013).

The "to coach and develop people" factor is a crucial duty of a lean leader, most of this development occurs daily in the workplace (Dombrowski and Mielke, 2013; Aij *et al.*, 2015).

Characteristics and values	Authors
Empowerment (daily management of the processes) and employee involvement in decision making Self-development	Poksinska <i>et al.</i> (2013), Aij <i>et al.</i> (2015), Assen (2016), Aij and Rapsaniotis (2017) Dombrowski and Mielke (2013), Dombrowski and Mielke (2014), Poksinska <i>et al.</i> (2013), Aij and Rapsaniotis (2017)
Development promotion and continuous learning of the others	Emiliani (2003), Dombrowski and Mielke (2013), Dombrowski and Mielke (2014), Poksinska <i>et al.</i> (2013), Aij and Rapsaniotis (2017)
Respect for people	Emiliani (2003), Assen (2016), Van Dun <i>et al.</i> (2016), Aij and Rapsaniotis (2017)
Personal observation and visits to the factory floor	Dombrowski and Mielke (2013), Dombrowski and Mielke (2014), Poksinska <i>et al.</i> (2013), Aij <i>et al.</i> (2015), Van Dun <i>et al.</i> (2016), Aij and Rapsaniotis (2017)
Vision creation, goal establishment	Dombrowski and Mielke (2014), Assen (2016), Van Dun <i>et al.</i> (2016), Aij and Rapsaniotis (2017)
Development of a proper environment for continuous improvement, proactivity for changes and a structure and routine for problem solving Decisions based on facts and data Focus on safety, quality, effectiveness and efficiency Actions that are consistent to the organization's values and culture Attention to the employee's satisfaction and to human development Cooperation and trust development	Emiliani (2003), Poksinska <i>et al.</i> (2013), Dombrowski and Mielke (2014), Assen (2016), Van Dun <i>et al.</i> (2016), Aij and Rapsaniotis (2017) Dombrowski and Mielke (2014), Van Dun <i>et al.</i> (2016) Aij and Rapsaniotis (2017) Poksinska <i>et al.</i> (2013) Aij and Rapsaniotis (2017) Dombrowski and Mielke (2014), Aij and Rapsaniotis (2017) Emiliani (2003), Poksinska <i>et al.</i> (2013), Aij <i>et al.</i> (2015), Assen (2016), Van Dun <i>et al.</i> (2016)
Performance control, measurement and recognition Recognition of the submission of ideas for improvement and active participation in improvement realization Support to the led ones and doing formal and informal meetings Modesty and openness Cooperation and group work facilitation, coaching practice Feedback and information sharing	Poksinska <i>et al.</i> (2013), Van Dun <i>et al.</i> (2016) Poksinska <i>et al.</i> (2013), Assen (2016), Van Dun <i>et al.</i> (2016) Poksinska <i>et al.</i> (2013) Assen (2016), Aij <i>et al.</i> (2015) Emiliani and Emiliani (2013), Dombrowski and Mielke (2014), Assen (2016), Van Dun <i>et al.</i> (2016) Poksinska <i>et al.</i> (2013), Assen (2016), Van Dun <i>et al.</i> (2016)

**Table I.**  
Lean leadership characteristics

People participate in the lean process, providing the intelligence and energy needed to drive the change (Aij and Rapsaniotis, 2017).

Given this context, lean leadership must develop competences in their employees to grant the operational control and management autonomy, creating a responsibility sense (Anand *et al.*, 2009; Puvanasvaran *et al.*, 2009). Adequate training is also essential to develop multidisciplinary workers, with capacitation, ability and knowledge to continuously improve the processes (Emiliani, 2003). The ability to perform and manage work brings an intrinsic motivational quality to people, thus, it is possible to relate the skill development to the employees' motivation toward work (Dibia *et al.*, 2014).

Considering leadership related to improvement groups and *kaizen*, the followers will be accepting the risk and being challenged, the leaders must be charismatic, stimulating and supportive, making every member of the company do their best (Fujimoto, 1999; Monden, 2011). Leaders must challenge the employees to achieve improvements that can encompass the standardization of activities, decrease in lead time, increase of productivity and quality, as well as cost and waste reduction (Monden, 2011).

Employees from companies like Toyota are trained to systematically and repeatedly solve problems, following scientific thinking and an improvement method (Spear and Bowen, 1999; Emiliani, 2003; Assen, 2016; Van Dun *et al.*, 2016). The *kata* coaching model allows leaders to disseminate the culture of continuously solving problems of the processes by employees, enabling their training and development (Spear and Bowen, 1999; Dombrowski and Mielke, 2013).

For Liker and Convis (2013), the daily support *kaizen* factor represents the way a company operates improvement in its most primary level, and the leadership should support and practice it. Spear and Bowen (1999) identified two rules for supporting and encouraging daily *kaizen*. The first regards the standardization of processes, sequence of activities, execution time and product specification, which eases the detection of problems. The second rule specifies the connection among people for the execution of the processes, which must be standardized, direct, and with the definition of involved employees and delivery to clients.

The *gemba* walk represents the leader's walk in the workplace with their employees, supporting the daily *kaizen*. Initially, its role is to develop an explanation for the cause of an identified problem and its possible solution (Mann, 2010). The *gemba* walk can assist in the introduction of the value stream map and in the identification of waste, such as excessive lead time, costs, time, wastes, among others (Tyagi *et al.*, 2015; Seth *et al.*, 2017). As teaching and learning progress, the leader's approach is modified, beginning to suggest challenges to those who are led and promoting a follow-up in the next walk, which allows to solve problems faster (Mann, 2010; Aij *et al.*, 2015).

The "to create vision and align goals" factor aims to translate and unfold the company's vision and strategic priorities to the groups' activities and goals through the leader (Liker and Convis, 2013). This goal unfolding process trains the team in strategical learning, planning and goal setting, in addition to increasing the understanding of the links among practices, operational goals and strategic results. The *hoshin kanri* can be used to ensure the alignment of priorities and actions vertically and horizontally within the company, ensuring the connection between the work group and other areas of the company (Emiliani, 2008). Therefore, the leader is also attributed with aligning and conducting, in the led ones, the vision on the company's priorities and goals to be achieved by the team, unfolded by the *hoshin kanri* planning (Inamizu *et al.*, 2014; Dombrowski and Mielke, 2014).

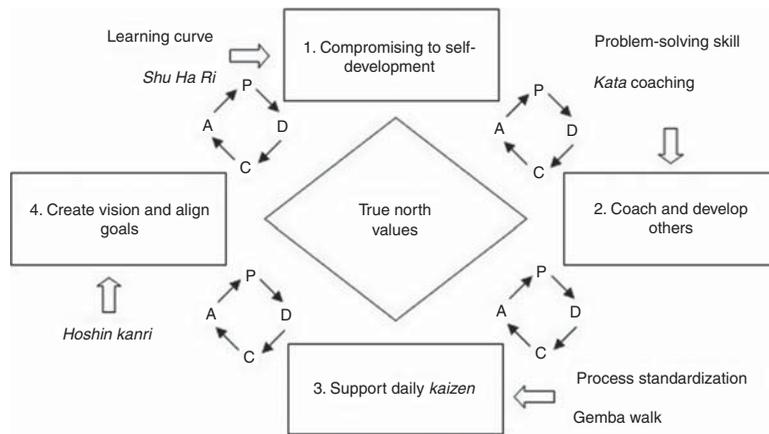
These four factors by Liker and Convis (2013) were used in actions that created a conceptual model used as reference for the action research (Figure 1).

### 3. Research methodology

The research was developed using a qualitative method: action research. This type of method is based on obtaining qualitative information regarding the diagnosis of the organizational environment to propose the planning and implementation of changes in this environment (Coughlan and Coughlan, 2002). In this research, the objective was to raise the actions and practices of leadership that sustain the LPS.

Action research is the method to be used when the research topic is related to the description of a series of actions implemented over time in an organization (Coughlan and Coughlan, 2002). The following question guides the study: "Which actions and practices, according to the models identified in the literature, should leadership take to maintain the LPS?" In this sense, this study describes a change process in the leadership practices of a company that adopted the lean approach.

Research actions were planned to promote changes in leadership practices in the supervision of the planning, programming and production control (PPPC) area of a production unit of a large-scale Brazilian multinational company, engaged in the lean transformation for eight years. Ten people composed the team: three production controllers,



Source: Adapted from Liker and Convis (2013)

Figure 1. Research concept model

four production programmers, two production-planning analysts and one supervisor. The other leadership levels (tactical and strategical) and other supervision areas were not within the research scope.

The conduction of the field research phases involved, as suggested by Coughlan and Coughlan (2002), the data gathering, data analysis, suggestion of an action planning and implementation and assessment. The research was performed by a group of four researchers in the lean, authors of this paper, named as research team. This team kept contact with the PPC area from the diagnosis until the assessment of the results (six months). The action research was supported by a systematic literature review (SLR – Figure 2).

The SLR was performed in three databases, Web of Science, Scopus and Science Direct. They were chosen for showing relevant content from journals, conferences and articles that are relevant to this study, as well as international coverage in the researched area. The search terms used for title, abstract and keywords were (((“continuous improvement”) OR (“lean”) OR (“Toyota”)) AND (“leadership”)). After filtering and adding books, the material that contributed for the research model and for the development of theoretical references was selected.

The action research was based on the steps suggested by Coughlan and Coughlan (2002):

- (1) Data gathering: three approaches were used for the gathering: document analysis, interviews with employees from all areas and participative observation. Regulatory documents for the organization, registers of solved problems, training and skill

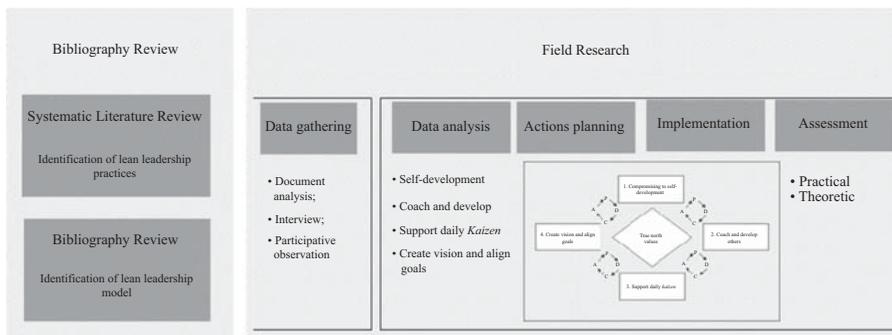


Figure 2. Research phases

assessment registers were consulted. The diagnostic interviews were conducted with the PPC manager and the PPC supervision. The interview was guided by an unstructured questionnaire (Table II). The questionnaire and the diagnosis were structured based on the four factors/research variables that guide the research model: to promote employees' self-development; to coach and develop employees; to support daily *kaizen*; to create vision and align goals.

- (2) Data analysis: the gathered data were analyzed and led to the creation of a diagnosis of the PPC area, regarding the leadership practices and related to the four studied factors, which encourage the team's development.
- (3) Action planning: during this phase, we searched for solutions for the identified problems, raised actions or changes in the practices related to the conceptual model's four factors. The kind of leadership support and how to strengthen the team and leader's compromise with the changes were also defined.
- (4) Implementation: actions were introduced in partnership with the PPC management, supervision, and employees. The implementation was organized from a meeting with the management and from another with the employees of the area, aiming to show the goals and the support needed for the actions, clarifying that the whole intervention would be assessed before implementation to avoid conflicts with the organization's standards and to validate the proposals for changes.
- (5) Assessment: this process was divided into two phases. The first consists on the analysis of the leadership practices related to the LPS maintenance, based on the employees' development. The second assessment consists on the theoretical discussion about the results, i.e., through a descriptive approach it was aimed to empirically analyze the actions performed while considering the conceptual model.

Factors	Questions
1. To promote employees' self-development	How is the process for the self-development of employees? What types of skills are developed? Is there an analysis of what skills the employee should develop? How frequently is the skills assessment performed? What is the role of leadership in employee development?
2. To coach and develop employees	How do leadership practices promote employee self-development? What skills are developed for the employee to continuously improve their work? Is there the development of autonomy and responsibility for the operation, control and management of processes? How is the problem-solving ability developed in the employees?
3. To support daily kaizen	What is the leadership involvement in employee development? What is the focus and objectives of kaizen projects? How does the involvement of employees in kaizen activities occur? Do leaders use the results of kaizen projects to stimulate the development of employees?
4. To create vision and align goals	How leadership practices mobilize people to the daily kaizen? How are organizational goals and objectives formulated and disseminated to the organization's employees? What is the participation of employees in the process of formulating and reviewing the goals and objectives of the organization? How does leadership utilize the organization's goals and objectives to stimulate employee development? How do leadership practices promote the achievement of goals?

**Table II.**  
Factors and research questions

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## 4. Action research

### 4.1 Data analysis: diagnosis

This section has two main objectives. First to characterize the organizational context, especially the individual relationships; the second objective is to identify the main deficiencies in the practices used in the four factors that guide the leadership model identified in the literature review.

The research was conducted in a large Brazilian company, publicly traded, operating in the aerospace industry and that has three production units in Brazil. Field research was conducted in the PPPC area of one of the plants.

*4.1.1 Organizational context.* This research was conducted in PPPC area of a production unit of the large-scale Brazilian multinational company. This area of the researched company will be described to provide a better understanding of the analysis.

The PPPC cell is composed by production controllers, production programmers, production planners and supervisor. For the researched company, the production is not serial, but make-to-order and each manufacturing order is called project. Thus, the PPPC does not present the traditional characteristics seen in serial production companies, in which the challenge is to create the supply chain necessary for the production of lots. The PPPC of the researched company (unit) is responsible for supply chain management and acts on the critical path of the projects demanded, i.e., it tries to anticipate the potential problems that may occur during the course or lead time of the project.

The functional areas of the company are divided into cells, in which individuals are trained in specific technical competences, generic functional competences, managerial competences and human competences. Specific technical competences comprise the set of skills and knowledge that employees must possess to perform their core function with excellence. For example, within the PPPC cell, the production planner must have a specific set of knowledge that allows him/her to establish a set of activities of a project, identifying the different paths, resource needs, such as materials, labor, machines and financial resources. The production programmer is responsible for planning and organizing production activities within the established quality specifications and standards.

Generic functional competencies consist of the set of knowledge on the operational flow of the cell. As an example from the case of the researched PPPC cell, the production programmer is expected to understand the importance of his/her function to achieve the department's goals, i.e., the context that the work is inserted. In this case, the production programmer must understand that the scheduling of activities is deployed from a project path management. The competences of production controllers and production planners are similar.

Management competences refer to the set of knowledge and skills related to decision making, problem-solving and process improvement. In this sense, employees of the PPPC and from other cells of the company act in a participatory way in the establishment of the organizational guidelines, including the organizational strategic planning. Through this, the company tries to involve the employees in the accomplishment of the goals and objectives traced for a certain cell, offering autonomy for the employees to administer the functional activities that allow the goals to be reached.

Finally, human competences are related to an employee's ability to act in a team. Since the company is organized in cells with high degree of autonomy to meet their management goals and objectives, the human relationship within the team becomes more necessary due to the interdependence and cohesion of the functions performed by the employees.

The researched company presents a Business Excellence Program (BEP), composed of managers and people from the human resources department. Their objective is to develop the four sets of competences in the cells, considering the values of lean thinking and leadership practices.

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Employees of all company cells are trained in lean practices that seek to reduce waste and continually improve the organizational processes. The company's cells are evaluated annually by the members of the BEP, considering the evolution of the four sets of competences and the practice of lean thinking, regarding the identification of points of waste, opportunities for improvement, planning and implementation of improvement actions, in addition to the establishment and execution of *kaizen* projects. Given this context, the BEP evaluates the cells, classifying them with gold, silver and bronze status.

*4.1.2 Diagnosis of the four factors of the model.* 4.1.2.1 To promote employees' self-development. The diagnosis of the employees' self-development process was made through the analysis of the competences and the individual development process. The competence analysis is made annually through an interview between the leader and the employee. The following competences are assessed: teamwork, technical knowledge, business vision, lean thinking, communication and results for the company. From this evaluation, the manager proposes a development plan for each employee.

The process of employee development is focused on two essential competences for the improvement practice: technical knowledge, which allows the development of organizational changes; and lean thinking, which allows the understanding of the points of waste and bottlenecks. For the development of the technical competences, employees go through a qualification phase, which comprises the apprentice follow-up by a more experienced colleague who is named as a tutor. The follow-up time is determined jointly by the apprentice and the tutor, according to the learning development.

Technical qualification is constituted by two phases. The first refers to the period in which the technical knowledge is passed on through demonstration and observation, as the tutor performs the activities. There is no structured checklist containing the competences that should be absorbed by the apprentice and passed on by the tutor. The apprentice starts to learn the process' routine, problems and decision making, absorbing the explicit knowledge from the documented procedures and the tacit knowledge from the abilities and attitudes through the social contact with the tutor. In the second phase, the apprentice is sent to perform the process and puts into practice the new knowledge, the tutor only interferes if the apprentice presents any doubts.

Trainings are performed using distance education in lean tools and techniques (root cause analysis, flow mapping and analysis, etc.), and lean principles, comprising the follow-up of the continuous improvement agent, an employee responsible for supporting the improvement and development of employees. The effectiveness of the lean development is verified during the assessment of the skills.

Through this diagnosis, we did not observe lean leadership practices that aim to deepen the technical knowledge and lean thinking. Follow-up of practices only occur for those that were already performed by more experienced employees, the monitoring of negative points and on the improvement possibilities of these activities do not occur. There is little emphasis on understanding the PPPC principles. The research concluded that the self-development process is little directed by the leader (in this case, the PPPC supervisor) and it does not guarantee the learning of all skills according to the needs of the PPPC.

4.1.2.2 To coach and develop employees. Regarding the "to coach and develop employees" factor, the diagnosis assessed the practices adopted by the PPPC area that support the problem-solving and decision-making process by the employees.

The employees' training in the problem-solving methodology is also done using distance education. After the coaching there is no system to develop the problem-solving ability in the employees.

The analysis of the record of problems solved by the PPPC area members was done to determine the abilities level and the system of the problem-solving method. From the

analysis, the research group identified that the employees know the phases of the PDCA cycle and are demanded by the training performance, however, they show difficulties in the problem's definition and deployment, goal definition, identification of the root cause, suggestion of countermeasures and efficiency verification. Some employees tend to skip phases, for example, they do not define the problem or analyze the root cause, they go straight for a solution; the problem-solving record form adopted does not establish the logical sequence to be followed. Thus, the problem-solving process reveals deficiencies in the development of the problem-solving skill by the leadership.

4.1.2.3 To support daily *kaizen*. Regarding the “to support daily *kaizen*” factor, the diagnosis focused on understanding the organization of the goals and *kaizen* activities and sought to assess how the leadership practices are organized to mobilize people to the daily *kaizen*.

From the interviews with the team, the group verified that *kaizen* is understood as an intense and focused one-week event, in which a group of people from different areas have problem solving as their objective. The *kaizen* projects, despite being associated to an improvement in results are related to the standardization and establishment of an activity, and not necessarily to an improvement of the existing standards in operational efficiency. The *kaizen* is more corrective and reactive than related to performance improvement.

The focus on standardization can be related to the way improvement opportunities are detected, especially through the identification of an unfavorable tendency of the process effectiveness, like meeting deadlines or quality. Thus, employees show difficulty to assess and gather improvement opportunities related to the operational efficiency.

The diagnosis of this factor found two main problems. The first is a flaw on the concept of *kaizen* actions adopted, which seeks to keep the processes standardized and not their improvement. The second is the corrective focus on the improvement, i.e., they do seek higher performance levels, but a stable process.

4.1.2.4 To create vision and align goals. Regarding the “to create vision and align goals” factor, the diagnosis focused on understanding how objectives and goals are communicated to the area's members and which leadership practices are used to promote vision and goals, as well as to guarantee its achievement.

The company's strategic planning is designed and the goals are deployed until the PPPC supervision level. The supervision, alongside the higher hierarchy level, develops the objectives and goals until the process levels. The employees responsible for each process are also responsible for monitoring the indicators, except for a case of deep goal changes, a case like this is the responsibility of the supervisor.

However, as already mentioned in the daily *kaizen* description, the monitoring is more related to the identification of problems in the indicators and the stabilization of processes, i.e., the objectives and goals are not used for the development of the employees. The goals are not challenging and there are very few that demand process improvement.

#### 4.2 Action planning

During this phase, the research group suggested actions to be implemented in the next research phase, for the problems identified in the previous phase. The solutions were suggested and discussed during meetings between the research team and the area team. The solutions were suggested according to Table III.

#### 4.3 Implementation

This topic shows the implementation of the solutions suggested by the research team and the employees of the area.

**Table III.**  
Correlation between  
problems and  
suggested solutions

Research model factor	Problems	Suggested solution
Self-development	The employees' capacitation process is little directed by the leader The employees' training is performed by demonstration and observation The skill is acquired by practice, as the need for performing a certain activity arises There is no practice directed to the skill in the lean principles	Creation of a skill management instrument, using the <i>Shu Ha Ri</i> self-development model as reference. For such, the following steps were suggested Adjustment of the skill management model to the <i>Shu Ha Ri</i> cycle Mapping of the responsibilities of each PPPC position (to map current and descriptive responsibilities of the positions; To perform benchmarking with other PPPC company's areas and to set up a schedule for the development of the employees) Implementation of the <i>Shu Ha Ri</i> development model in the area (performing the employees' assessment according to the skill management model; definition of the facilitator responsible for the coaching of each skill; designing the individual development plan)
To coach and develop employees	The problem-solving skill development is deficient, since it is not used by the leader to develop employees	Using the instrument to direct the thinking toward problem solving (A3) and creation of a routine to support the development of the problem-solving skill. The following steps were suggested: to establish a logical procedure and standard form for problem solving (A3) (to perform training in the methodology; to design a guide to direct form filling) To establish a routine of follow-up on improvement projects and to release it to employees
To support daily <i>kaizen</i>	The <i>kaizen</i> methodology is used for process standardization and there is a lack of routine to identify improvement opportunities	Restructuring the problem management routine and structuring a routine to encourage problem gathering: gemba walk
To create vision and align goals	The essential change goals are under the supervisor's responsibility, the improvement goals are related to the procedures stabilization, not having employee development and goal's sharing	Practice of vision and strategic priorities discussion, deploying goals to the employees and feedback of achieved results in relation to goals and goal's review

4.3.1 *To promote employees' self-development.* 4.3.1.1 Adjustment of the skill management model to the *Shu Ha Ri* cycle. In this phase, a pattern for each of the *Shu Ha Ri* stages (Table IV) initially, the guidelines that the leader should support the employees' development were also established; the employees are responsible for the evolution in the *Shu Ha Ri* stages.

**Table IV.**  
Standardization  
of the *Shu Ha Ri*  
cycle's stages

Learning cycle stage	Meaning
<i>Shu</i>	Represents the period in which the employee in training performs each process accompanied by the facilitator until the moment when they can perform it without needing guidance
<i>Ha</i>	The process is performed without the support of a script or manual and the employee is conscious of the impacts caused by incorrectly performing the process. This is the training stage in which they understand the reason and importance of each action they perform
<i>Ri</i>	Represents the learning stage in which the employee starts to question the process and to perform improvements. In this phase, the employees begin their training in problem solving and by a scientific method, deepen their process knowledge

The rules for the cycle conduction involve designing an evolution plan of *Shu Ha Ri* stages by the employee and the leader, performing a quarterly meeting between the leader and the employee to follow the evolution in the cycle and review the evolution plan, as well as the definition of the learning facilitator by the leader.

4.3.1.2 Mapping of each PPPC position’s responsibilities. This action was divided into three phases:

- (1) definition of all positions and respective skills, comprising the creation of a skill × required positions matrix;
- (2) performing benchmarking with other company’s PPPC areas about the required attributions and responsibilities for each position to guide the coaching phase; and
- (3) establishment of an individual schedule for each employee, containing their positive and negative points considering the required skills for the position.

4.3.1.3 Implementation of the *Shu Ha Ri* development model. The steps for the implementation of the *Shu Ha Ri* cycle involved: the assessment of the employees according to the skill management model; definition of the facilitator responsible for coaching each skill and designing the individual development plan. The steps are described in Table V.

4.3.2 *To coach and develop employees.* For this factor, the creation of a teaching process that follows problem solving was suggested.

4.3.2.1 Usage of a tool to guide problem-solving. The tool used to guide the process of thinking problem solving was the eight-step model developed by LPS for problem solving (Marksberry *et al.*, 2011), displayed in standard form in A3 size.

It was defined that, whenever a problem occurs, the team should start filling the form. The purpose of the form is to suggest, in a single sheet, all the steps that are visible and connected,

Steps	Description
Performing employees assessment according to the skill management model	Individual meetings between the leader and employee to identify the employee performance level in the <i>Shu Ha Ri</i> cycle. For the stage definition, the manager asks two questions: in your opinion, in which stage are you in? And why did you choose that stage? If the answers corroborate with the leaders’ view, it is maintained, if the employee has a different position, the leader argues, through examples, in favor of the classification
Defining the responsible facilitator	The facilitator must fit at least in the <i>Ha</i> stage of the cycle, and should know and have the ability of intrinsic activity performing, in addition to being proactive in teaching In the positions where there was more than one employee, the employee who is more experienced and willing to become a facilitator was chosen. For the other positions, considering that each individual is responsible for specific processes, it was established that each employee would be responsible for the qualification of their substitute
Designing the individual development plan	Distinct and standardized actions were defined considering each stage cycle: <i>Shu</i> (to perform the activity accompanied by the facilitator until it can be done without needing support), <i>Ha</i> (to perform the activity during three months without failing to meet the internal clients’ needs and technical requirements) and <i>Ri</i> (to perform improvement in the activity using the problem solving methodology) For each employee, a one hour-long meeting with the leader to present the action fit for the employee was done

**Table V.**  
Steps for the  
implementation  
of *Shu Ha Ri*

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a record of the problem summarizing its description, the existing gap between the current situation and what is desired, the root cause, solution and results. The employees were trained to use the instrument and a procedure to fill the problem solving form was created.

4.3.2.2 Establishing a routine to follow up the improvement of projects. The research team identified the need for a systematic meeting to keep the focus on improvement, i.e., the project's purpose, goals, deadlines and budget that were defined during the planning phase, and also to act on the standardization and development of training for the employees involved. The meetings last for an hour, occur weekly and involve the implementation team and the leader, they act according to the planned actions on follow-up and maintenance mechanisms, guaranteeing that the improvement project is not forgotten or archived and that the identification of new improvement points occurs, allowing the maintenance of improvement cycles.

4.3.3 *To support daily kaizen.* This section presents two leadership practices to promote daily *kaizen*: the establishment of problem management routine and the creation of a routine for problem gathering, based on gemba walk.

4.3.3.1 Restructuring the problem management routine. After the reviews, the group suggested an instrument that already exists in some of the company's areas, called quality clinic. This instrument consists on one hour-long weekly meetings with the participation of all PPPC employees under the coordination of the area manager. During these meetings, all employees are encouraged to report problems in their processes, the problems are summarized by the leader using a brainstorming approach, and then they are classified according to their nature, for example, problems related to suppliers, employee training, among others. Later, an action plan is created for each identified problem.

The meetings also deal with the follow-up of problems gathered during previous meetings, questioning those who are responsible for the implemented actions if they found difficulties and the initial changes in the improvement suggestion, as well as the respective justifications.

4.3.3.2 Creation of a routine gemba walk. The team reviewed the PPPC processes and assessed, considering the product to be delivered: the clients' expectations, involved processes and process indicators.

The research team and the leader introduced the gemba walk for the analysis of processes' problems. This approach is based on the critical process analysis, in which, weekly, two employees are called by the area's manager to take part in a meeting with the objective of raising negative points in the processes that can become improvement opportunities. The maximum duration of this meeting must be of an hour. The others employees are invited to participate and elucidate problems on the processes. The participation of employees who have relationship with the investigated process, such as client or internal supplier, is important to point the negative aspects and improvement suggestions.

4.3.4 *To create vision and align goals.* The review of the goals and indicators of the processes performed in the last action helped in the identification of faults in the vision sharing and goals alignment. The group suggested an annual meeting to communicate the area's goals and the deployment of these goals and objectives for the processes and employees, together with the hierarchy level above the PPPC supervision.

Measuring the achievement of the objectives should be possible through existing process indicators or new indicators that can be created. The goals should be the input for *kaizen* activities, developed with the help of the A3 instrument, thus, aligning improvement activities and the company's goals.

Every three months, feedback meetings on the achieved results must occur, in which the leader and the employees must be present and, every six months, there must be a meeting for goals' review.

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#### 4.4 Assessment phase

The actions were analyzed during the implementation through research team meetings. The assessment phase is constituted by two parts, the first is an analysis of the practical results achieved, and the second consists of a theoretical discussion on the results.

*4.4.1 Practical results assessment.* 4.4.1.1 To promote employees' self-development. A higher level in the skills development of the employees who went through the *Shu* and *Ha* stages was verified. These stages allowed more safety and autonomy in the activities performance. The *Ri* stage showed bigger challenges during the implementation, since not all employees sought to deepen the understanding of the process they were trained in. The main cause was identified as the lack of time to fulfill the development plan due to the employees' routine. Another cause observed were the personal characteristics of the employees, who tend to focus on procedures and, consequently, give less importance to understanding the processes and their improvement, i.e., there is little reflection on the problems of the process.

The leader's discipline on the operationalization of the *Shu Ha Ri* stages and on the follow-up of the individual evolution of the employees is a success factor for the skill management process.

The mapping of PPPC's activities and the definition of roles and responsibilities clarified the skills needed for the positions of the area. We also observed that, during problem solving, the employees developed into themselves the lean principles and instruments as the problems were analyzed and the solutions implemented.

4.4.1.2 To coach and develop employees. The implementation of the tool to promote problem solving helped in the systematization of that practice, since it makes the employees stop overlooking phases. The problem-solving skill presented development and a knowledge gain occurred, which was confirmed by attitudes. More autonomy in decision making led to more informed opinions and fewer doubts during problem solving.

The challenges found during the follow-up meetings involve difficulties during the operationalization of the A3 instrument, such as establishing the measurement method, unfolding the problem, identifying and proving the root causes and verifying the effectiveness of the actions implemented, as well as complying to agreed deadlines. This reaffirms the importance of routine of follow-up processes on the improvement of projects to maintain the discipline. Low maturity in the use of problem-solving support tools and the lack of systemic vision from the employees created difficulties in the development of more complex reasoning. The instrument and the systematic improvement of follow-up provided a better understanding of the lean principles and instruments as the problems were being solved.

4.4.1.3 To support daily *kaizen*. Although the area's employees presented an understanding on the processes and their barriers, it was clear that the main problem in this factor lied in the understanding of the process' goals and in the relationship with internal customers. Thus, the research team decided to begin this phase by mapping the processes, considering the *gemba* walk approach to break the existing paradigm among the employees that *kaizen* is only focused on correcting processes and establishing standards. During this phase, the research team established performance and customer's expectations indicators, promoting a better understanding of the cause and effect relationships of the employees on the processes.

The research team introduced two mechanisms for the development of daily *kaizen*. The first, called quality clinic, uses a corrective approach that applies a problem-solving systematic, involving the largest number of employees possible. The second has a process enhancing character, consisting on the *gemba* walk, in which the manager leads the change process seeking continuous improvement. Both approaches are accompanied by follow-up processes of the problem or improvement implemented, promoting assessment and reflection in phases C (check) and A (act) of the PDCA cycle.

4.4.1.4 To create vision and align objectives. The involvement of the employees with the communication and deployment of goals and objectives for each process was identified. The indicators were reviewed and new ones suggested, and those were aligned to the improvement identification.

Only one feedback meeting on achieved results was done, however, this meeting was enough to show that the projects are more aligned to the company's goals and not only to the standardization, the leader had a major role in such alignment.

Table VI shows the results achieved, such as the development of new leadership practices and the impacts on employees.

4.4.2 *Analysis and theoretical discussion.* This research analyzed the implementation of a model that supports the lean approach, through leadership practices that allow the development of employees. The results show that the application of the factors and practices of the model, to promote employees' self-development, to coach and develop employees, to support to the daily *kaizen*, and goal alignment, is related to the maintenance of the lean approach.

The self-development happens through the employees' training and skills development. The action research focused on the dissemination of absorbed skills from more experienced employees (facilitators). Despite the existence of a method for skill analysis and of a qualification plan, the company did not have a critical review process on the knowledge, abilities and attitudes adopted. The area's leader possesses a major role in the self-development of the employees now. The *Shu Ha Ri* cycle stages are important to break the paradigm of repeating existing patterns, moving toward a more proactive approach and to self-development. The adoption of the cycle becomes important for the leader to identify the employees' maturity regarding his/her level of reflection on the process and its problems. To identify what needs to be learnt in each position, a skill × position matrix was made, in which the abilities and knowledge were deployed considering the processes' needs.

Another important aspect of the employee development plan is the presence of a facilitator, who guides the knowledge proliferation to less experienced employees. Differing from the traditional model, in which the facilitator usually is selected considering his/her

Factors	Practices developed by leadership	Results for the employees
1. To promote employees' self-development	Management and development of competences, through the <i>Shu Ha Hi</i> model as standard learning process Establishment of position and skill analysis and establishment and monitoring of an individual schedule for each employee	All employees reached the <i>Ha</i> stage and are developing the <i>Ri</i> stage All employees have an understanding of the competences related to their position, allowing for greater autonomy in performing the activities
2. To coach and develop employees	Problem-coaching meeting (Coaching <i>Kata</i> ) Implementation and monitoring of a tool to guide problem solving	All employees were trained in the A3 instrument All employees began to develop improvement actions with help from A3 and follow-up meetings
3. To support daily <i>kaizen</i>	Problem management meeting (quality clinic) Meeting of opportunities for improvement and process analysis ( <i>gemba walk</i> )	All employees gained an understanding of the work process, their goals and their relationship with internal customers
4. To create vision and align goals	Annual meeting for the communication of the area's goals and the deployment of these goals and objectives for the processes and employees Feedback meetings on the achieved results and review meetings	The definition of goals is done with the participation of all employees in the area Employee improvement projects are aligned with the proposed goals

**Table VI.**  
Results achieved

time in the company. In the *Shu Ha Ri* cycle, that employee must be classified in the *Ha* level at least, considering that a *Ri* level facilitator presents the ideal characteristics as he/she underwent a longer process of reflection and changes.

The diagnosis of the “to coach and develop employees” factor was centered on the problem-solving process, since the focus of a lean approach is on waste reduction and continuous improvement. Therefore, the problem-solving process becomes a key process for coaching and developing employees. In the diagnosis, the main problem identified was the employees’ lack of knowledge of a structured model for problem solving.

The suggested solution was to create a routine to support the development of problem-solving skills. The problem-solving process was conceived from two pillars. The first consisted on the designing of a standard form, based on the A3 instrument. The second consists of the follow-up of the suggested improvement through structured meetings aiming to guarantee the project’s continuity, assessment and closure using the standard form.

The building of a structured solution model allows the company to develop two kinds of knowledge. The explicit, which is built by filling out the form, recording the learnt lessons and best practices for the mapped solutions. And the tacit, which is accessed by the problem-solving process, developed in the individuals through skills and abilities and disseminated with the help from the follow-up meetings, and also by filling out the form.

The implementation of the second pillar is related to the employees’ skill building through follow-up and feedbacks from the leader.

Regarding the “to support daily *kaizen*” factor, the lack of a procedure for analyzing improvement opportunities was verified. The team observed a misconception on their interpretation of the *kaizen*, which consisted on actions that sought to standardize the processes. The research team suggested the implementation of two routines, one for problem management and one for problem gathering. The problem-solving routine was based on a weekly meetings model conducted by the area’s manager, in which the employees are encouraged to report problems occurring in their processes. After defining the problem, the team develops an action plan and a follow-up routine plan.

Regarding the problem gathering, the *gemba* walk approach was introduced, which is also based on systematic meetings to discuss the processes’ problems with the employees. This systematic meetings model offers the opportunity of discussing problems observed during the routine of the employees, as well as suggesting improvement projects to solve those problems. Some factors can be considered key to the success of *kaizen* and meetings initiatives, the first is the involvement of process-aware employees, as well as of employees who have a customer or process supplier relationship, they can offer a wider view of the failures and possible solutions.

Another important factor is the managers’ participation in those meetings. The improvement actions must be boosted by management, which has a directing and guiding role in the process. The team realized that, in the previous *kaizen* model, a structured way to follow-up those involved in an improvement initiative did not exist. The lack of follow-up leads the employees to discredit the program. Thus, both approaches introduced for the *kaizen* considered meetings to verify the results and reflect on new improvement opportunities, in an organizational learning process.

Regarding the “to create vision and align goals” factor, the group identified that although the deployment process had goals and objectives, they were focused on the leadership and not shared with the employees. There was an effort for the creation and sharing of goals for each process, to promote improvement and the follow-up of the processes aligned to the company’s goals. Feedback and review meetings were suggested to engage the employees and are important as feedback to the model, enabling self-development with the creation of new skills and developing the employee with problem-solving and the identification of new improvement opportunities.

## 5. Conclusion

### 5.1 Theoretical implications

This study showed, through an action research in a manufacturing company, the practices that support lean leadership. Although there are other studies on the theme, this research filled a gap found in the literature regarding the establishment of practices by the leadership that support lean approach, using a consolidated model in lean leadership by Liker and Convis as the basis, and assuming a descriptive character by establishing leadership practices.

Although the company's employees were already familiar with the lean instruments, since the company already had an excellence program based on the lean approach. The diagnostic phase of the action research raised critical problems related to the leadership behavior. The diagnosis of the problems, based on Liker's and Convis' model factors, proved to be efficient in the identification of leadership problems. Regarding the "employees' self-development" factor, it was verified that there were problems in the technical qualification and that there was no structuring of leadership practices to promote the self-development of the employee. The "to coach and develop employees" factor showed lack of systematization in the problem-solving and improvement processes. As for the "to support daily *kaizen*" factor, it was found a mobilization of the leadership and subordinates toward the standardization and stabilization of the processes, in a corrective and reactive approach. Finally, for the "to create vision and align goals" factor, it was analyzed a concern in the goals control oriented toward the processes' stabilization and little involvement of the employees with the company's goals and strategic objectives.

Therefore, the first main conclusion of this research refers to the lack of reflection by the leadership and employees on the problems and improvement opportunities. Even though the lean approach had been implemented in the company before the introduction of the lean leadership model, it is observed that the four factors discussed show a reactive or corrective character. The attitude of the leadership and employees was focused on fulfilling the routines, and not on developing practical skills in the lean approach. The challenge was to establish and introduce leadership practices capable of promoting behavior changes in employees and in the leadership itself.

The main challenge of the research team during the implementation of the leadership practices in the company was to promote changes on the way of acting, the values, and behaviors, present in the organization in the shape of culture, procedures and routines.

In this context, the development of the employees changed to be guided by the skills demanded by the processes and by the *Shu Ha Ri* cycle, in which the employee starts to reflect, question, learn and analyze improvement opportunities on how the process is executed. The coaching and development of the employees created a systematization of problem solving and the reflection on the processes' cause-effect relations. The support to the *kaizen* was split into two parts: the first related to the group problem-solving, in a reactive approach; and the second focused on reflecting about the best practices that can be inserted in the mapped processes, in a continuous learning context (through the *gemba* walk). And, lastly, creating vision and aligning goals allowed leaders and subordinates to develop the sense of focus and strategic alignment, and of priority and necessity of follow-up based on data.

Other conclusion about the lean leadership practices' implementation considers organizational learning. Leadership and subordinates should be encouraged to question how the activities are performed, in an experimental process of trial and error to reconstruct internal skills, i.e., offering dynamic capacity to the company.

The identified lean leadership practices corroborated the characteristics and values of the lean leader found in the literature, such as empowerment (daily management of the processes) and employee involvement in decision making; promotion of the development and continuous learning of the others; personal observation and visits to the factory floor;

vision creation, goal establishment; development of a proper environment for continuous improvement; proactivity for changes, and a problem solving structure and routine; recognition of the submission of ideas for improvement, active participation in doing improvement, feedback and information sharing (Emiliani, 2003; Poksinska *et al.*, 2013; Dombrowski and Mielke, 2013, 2014; Aij *et al.*, 2015; Assen, 2016; Van Dun *et al.*, 2016; Aij and Rapsaniotis, 2017).

This paper promotes academic implications when testing the Liker and Convis model for the improvement of leadership practices, the model was applied and yielded positive results. In addition to this contribution, this study advances in the unfolding of the model with the introduction of lean leadership practices, complementing the four factors proposed by the model and advancing theoretically. The identification of lean leadership practices allows the advance of future research through correlation studies between practices and results, analysis of a larger number of companies or leaders and the possibility of quantitative studies.

### 5.2 Practical implications

This study indicates a way for employees in a leadership role to follow to achieve lean thinking. Usually, the LPS implementation is focused on the training and insertion of lean techniques, however, several studies have shown that simply adopting lean techniques are not enough to deliver sustainable results when dissociated from leadership support. In this context, the leadership model by Liker and Convis emerges as an important instrument for the sustainable implementation of LPS. This contribution from this paper is the identification of organizational practices related to the four phases of the Liker and Convis model: to promote employees' self-development; to coach and develop employees; to support daily *kaizen*; to create vision and align goals. The commitment to self-development is related to the manager's commitment to the practice of skill management through the *Shu Ha Ri* stages. The second factor was focused on establishing a standardized problem-solving process. The "to support to daily *kaizen*" was implemented from the *gemba* walk approach to break the paradigm that *kaizen* is focused on process correction, stimulating the development of projects that promote performance increase in a process of continuous evaluation and reflection on the problems. Finally, the last stage of the Liker and Convis model was achieved through the process of policy deployment, in which the leader plays a key role in creating and communicating the new goals and objectives, as well as improvement projects to support these guidelines.

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**Corresponding author**

Rodrigo Valio Dominguez Gonzalez can be contacted at: [rodrigo.gonzalez@fca.unicamp.br](mailto:rodrigo.gonzalez@fca.unicamp.br)