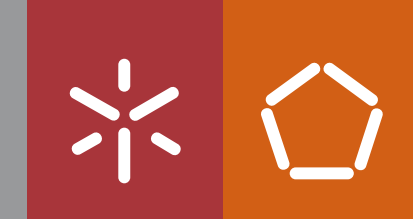


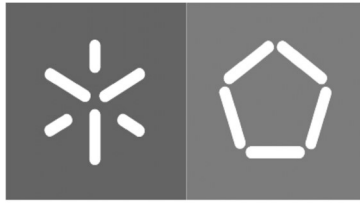


António Paulo Marques Pinto e Amaro

The integration of Lean Thinking in the
culture of Portuguese organizations:
enablers and inhibitors

Universidade do Minho
Escola de Engenharia





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Escola de Engenharia

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**The integration of Lean Thinking in
the culture of Portuguese
Organizations: enablers and
inhibitors**

PhD Thesis in Industrial and Systems
Engineering

Work carried out under the supervision of

Professor Anabela Carvalho Alves

and

**Professor Rui Manuel Alves da Silva e
Sousa**

2022, June

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Lastly, I would like to express my sincere thankfulness to my family.

Statement of Integrity

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The integration of Lean Thinking in the culture of Portuguese Organizations: enablers and inhibitors

ABSTRACT

Organizations are faced with challenges such as the globalization of markets, climate change, social issues, among others, which force them to prepare and organize themselves differently from traditional ways. They must innovate their processes and products to succeed against competitors and reduce their own waste, improving the way they design, produce and manage processes. To reduce this waste, organizations have implemented Lean Thinking which requires an openness to transform organizational culture, if this presents a barrier to this transformation. Thus, this PhD thesis aimed to develop a model to assess the Organizational Culture of organizations and suggest a way for them to integrate the principles of Lean thinking, delivering value to the customer, in those that are the key directional vectors of any organization: quality, cost, delivery, safety and morale.

The research began with a critical literature review, which provided the basis for this PhD. This included models of organizational culture, work organization and Lean implementation. During this review, it was found that there was no model that integrated the original basis of the Toyota model, Lean principles and an organizational culture model. Therefore, a three-dimensional model called the Integration of Lean Thinking into Organizational Culture (ILTOC) was developed which relates the three levels of Schein's organizational culture model, the five Lean Thinking principles and the Toyota Way 4P model. This model includes a methodology which is divided into five phases and which guides organizations towards its implementation.

To develop this model, a questionnaire, the "Bi-dimensional Instrument for Lean Culture Openness (BDILCO)", was developed and applied to five companies in northern of Portugal. The questionnaire aimed at diagnosing the Organizational Culture and measuring aspects related to operational effectiveness. The results of the questionnaire improved the understanding of the companies' awareness of the gap between the actual state and the integration of Lean thinking principles in the organizational culture. The model was validated in one of the organizations that participated in the questionnaire which was the case study explored. The main contribution of this PhD consists in providing organizations with a model to support those that intend to implement Lean Thinking in their Organizational Culture.

KEYWORDS: Lean Thinking, Organizational Culture, Schein model; 4P model

A integração do pensamento Lean na cultura das Organizações Portuguesas: facilitadores e inibidores

RESUMO

As organizações são confrontadas com desafios como a globalização dos mercados, alterações climáticas, questões sociais, entre outros, que as obrigam a preparar-se e organizar-se de forma diferente da tradicional. Devem inovar os seus processos e produtos para terem sucesso contra os concorrentes e diminuir os seus próprios desperdícios, melhorando a sua forma de conceber, produzir, e gerir os processos. Para diminuir estes desperdícios, as organizações têm implementado o pensamento *Lean* que requer uma abertura para a transformação da cultura organizacional, se esta se apresentar como barreira a esta transformação. Assim, esta tese de doutoramento teve como objetivo desenvolver um modelo para avaliar a Cultura Organizacional das organizações e sugerir um caminho para que estas integrem os princípios do pensamento *Lean*, entregando valor ao cliente, naqueles que são os vetores chave direcionais de qualquer organização: qualidade, custo, entrega, segurança e moral.

A investigação começou com uma revisão crítica de literatura, que forneceu a base para este doutoramento. Esta incluiu modelos de Cultura Organizacional, de Organização do Trabalho e de implementação de *Lean*. Durante esta revisão, verificou-se não existir um modelo que integrasse a base original do modelo da Toyota, os princípios *Lean* e um modelo de Cultura Organizacional. Assim, foi desenvolvido um modelo tridimensional designado de “*Integration of Lean Thinking into Organizational Culture (ILTOC)*” que relaciona os três níveis do modelo de Cultura Organizacional de Schein, os cinco princípios *Lean Thinking* e o modelo 4P da *Toyota Way*. Este modelo inclui uma metodologia que está dividida em cinco fases e que orienta as organizações para a implementação deste modelo.

Para desenvolver este modelo foi desenvolvido e aplicado um questionário, designado de “*Bi-dimensional Instrument for Lean Culture Openness (BDILCO)*”, a cinco empresas do norte de Portugal. Pretendeu-se com o questionário diagnosticar a cultura organizacional e medir aspetos relacionados com a eficácia operacional. Os resultados do questionário melhoraram a compreensão da consciência das empresas sobre o fosso entre o estado real e a integração dos princípios do pensamento *Lean* na cultura organizacional. O modelo foi validado numa das organizações que participaram no questionário que consistiu no estudo de caso explorado. A principal contribuição deste doutoramento consiste em disponibilizar às organizações um modelo para apoio às empresas que pretendam implementar o pensamento *Lean* na sua cultura organizacional.

PALAVRAS-CHAVE: *Lean Thinking*, Cultura Organizacional; Modelo Schein; modelo 4P

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LIST OF ABBREVIATIONS AND ACRONYMS

4P - Philosophy, Process, People and Problem Solving
5W2H - Who, What, Where, When, Why, How, How much
BDILCO - Bi-dimensional instrument for Lean Culture Openness
BPM - Business Process Management
BPMN - Business Process Management Notation
CEO - Chief Executive Office
CSF - Critical Success Factors
CVF - Competing Values Framework
EHS - Environment Health and Safety
GE – General Electric
GM - General Motors
ILTOC - Integration of Lean Thinking into Organizational Culture
IMVP - International Motor Vehicle Program
JIT - Just-In-Time
KPI - Key Performance Indicator
LO - Learning Organization
MI - Million
MIT - Massachusetts Institute of Technology
NUMMI - New United Motor Manufacturing Inc.
OC – Organizational Culture
OCAI - Organizational Culture Assessment Instrument
PDCA - Plan, Do, Check, Act
SAWG - Semi-Autonomous Work Groups
SDWT - Self-Directed Work Teams
sRQ - sub-Research Question
STS – Socio Technical System
TPS - Toyota Production System
U.S. – United States
VSM - Value Stream Mapping
WCM – World Class Manufacturing
Wind BOP – Wind Base of Plant

1. INTRODUCTION

This chapter presents the background and motivation that supported this research. Then, the objectives and specific purposes are presented, followed by the research methodology framework. To conclude, is presented this thesis organization and structure.

1.1 Background and motivation

The organizations are facing challenges such as globalization of markets, climate change, social issues, among others, which require them to prepare and organize differently from traditional. The traditional form of work inherited from Principles of Scientific Management of Taylor (1911), which has been adopted in all organizations of goods and services, appear to be outdated considering the social, cultural and economic context that is currently lived. The school, the internet, social networks have opened new prospects, prospects of a better life but also the perception of contribution to society that takes the need to feel involved.

Thus, the bureaucratic centralization from the application of Taylorism principles implemented to produce goods and services (hospitals, banking, insurance, large shopping centers, etc.) is deprecated. This centralization was characterized by a division of tasks and responsibilities between management and production that linger in the design and structure of organizations today (Graça, 2002): i) unilateral communication, closed, one-way: the information only goes down, not up; ii) there is a set of intermediary levels, between the top and bottom of the organization, all perfectly hierarchical (i.e., at different organizational levels) in a chain control, made up and down in line from the work of workers and the control of the controlling by the central control services; iii) there is a socio-spatial differentiation represented graphically in a chart.

The organizations are constituted by functional services to whom are attributed the organization of work: i) planning service, ii) organization of staff and methods, iii) technical service, iv) quality control service, among others. These services are designated functional silos (or islands) which prevented good communication between departments and do not contribute to an effective organization as it does not allow the synergy between these departments (Womack & Jones, 1994).

The 21 years of experience of the proponent of this Doctoral thesis in a large international company has shown that these functional silos exist and contribute negatively for the organization's efficiency. This

company that starts as a national company, grew up and now it has offices in 65 countries and currently employs 2500 employees.

The proponent of this thesis has been acquiring knowledge about Lean Thinking (Womack & Jones, 1996) either in training or in visits to national and international companies, including Toyota in Japan, and realized the many advantages of implementing this through cross-level organization where he works to end with the functional silos.

Lean Thinking is a philosophy that began at Toyota Company as Toyota Production System (Monden, 1998; Ohno, 1988) in the post-war whose goal was to reduce costs and increase productivity through waste elimination. Waste are all activities that did not create value from the customer point of view, i.e., that she/he is not willing to pay for. This system has become better known with the publication of the best-seller of MIT researchers, Womack, Jones and Roos "The Machine That changed the world" in 1990 (Womack, Jones, & Roos, 1990). This book presented the results of a study on the comparison of American and Japanese automotive industry, where the productivity of the second was superior to the first.

The Japanese Toyota achieved higher productivity with fewer resources (less space, less inventory, less human effort, less product development time, etc.). Thus, it was dubbed Lean Production whose key idea is "doing more with less". Moreover, the involvement of people, "doing it right first time," use of human potential (creativity), respect for people and their skills that brings a different organizational culture from the existent Taylor's culture, are fundamental to this philosophy (Sugimori et al., 1977).

Much has been said about Lean, many times, questioning the advantages of Lean Production but Lean is recognized as a management practice responsible for the returning of manufacturing to US companies (Donofrio & Whitefoot, 2015). Companies like GE appliances used Lean practices to reduce the time to assemble refrigerators to roughly two hours per unit from the U.S. average of nine to ten hours (Cowger, 2016). According to this author, Lean practices were a key factor to achieve this inshore process.

Many companies implementing Lean programs (either in public and private sectors) fail in accomplishing their goals (Bortolotti et al., 2015; Gary Cowger, 2016; Grigg et al., 2020; Lean Frontiers, 2017; Liker & Rother, 2010; Pakdil & Leonard, 2017; Pay, 2008; Sangwa & Sangwan, 2018; Saurin et al., 2020; Schonberger, 2019). Researches that are studying the numerous causes of this lack of success are being carried out (Bortolotti et al., 2015; Pakdil & Leonard, 2017; Sangwa & Sangwan, 2018). It was verified that Lean processes are successful in certain companies (Amaro et al., 2019; Hines et al., 2004; Knol et al., 2018; Lander & Liker, 2007; Liker, 2004; Womack & Jones, 1996).

Implementing and sustaining Lean is not equivalent. This occurs because there are barriers, namely, the lack of Organizational Culture, leadership, resistance to change, lack of top management commitment, Lean misunderstandings among others (Bortolotti et al., 2015; Gary Cowger, 2016; Grigg et al., 2020; Hines et al., 2018; Leme et al., 2016; Liker & Morgan, 2006; Pakdil & Leonard, 2017; Sangwan et al., 2003; Saurin et al., 2020; Schonberger, 2019; Shrimali & Soni, 2017). In specific, Organizational Culture is very hard to identify in a company because it is inherent to the company itself and, often, is a mix of some cultures. Moreover, Organizational Culture could be a facilitator and inhibitor, depending on the organization (Amaro et al., 2020).

Nowadays, Lean Thinking is still not recognized as an Organizational Culture and, the Lean achievement and Organizational Culture continue under discussion. Numerous current systematic literature reviews on Lean can be found, specifically, Ferreira et al. (2016), Goes et al. (2017), Boscari et al. (2018), Danese, Manfè and Romano (2018), Erthal and Marques (2018), Maijala et al. (2018), Antony et al. (2019), Dorval, Jobin and Benomar (2019), Ramori et al. (2019) and Antony et al. (2020). However, a gap was detected regarding research on the relationship between Organizational Culture and Lean Thinking because only one of these ten publications indicate a definition of Organizational Culture. Dorval, Jobin and Benomar (2019) projected an evidence-based classification of Organizational Culture. However, in terms of future study, it is pointed out the requirement for a more detailed knowledge on Lean Culture and its fundamentals, namely, artefacts, values, and beliefs.

The factors mentioned above contributed to the motivation of the theme of this thesis, i.e., the development of a model to integrate Lean Thinking principles into Portuguese companies' Organizational Culture. With this, companies could become more organized to continue their struggle to achieve more positive results (quality, cost, delivery, safety and moral) for their clients and stakeholders.

1.2 Objectives

This Doctoral Thesis aims to study the Portuguese organizations related to their Organizational Culture, identify their openness level to Lean Thinking principles and apply a model to integrate such principles. Throughout this study, the PhD student identified factors that enabled or inhibited this integration. For this, the following phases were followed:

- Recognition of factors that enable or inhibit Lean implementation;
- Selection of some organizations to study that were known to implement Lean and others that did not implement it;

- Identification of the openness level to Lean Thinking;
- Identification of the Organizational Culture predominant type of these organizations;
- Development of a theoretical model to integrate the Lean Thinking principles;
- Implementation of the model through a case study;
- Discussion and evaluation of the results;
- Identification of new research opportunities.

With the model developed, it is intended to guide companies to implement Lean Thinking or, for those that have already tried and failed, to recognize factors that led to failure and how to improve. In addition, it is expected to get a model that organizations which want to implement Lean Thinking can adopt. With this, it is expected that the implementation is successful in every way, i.e. customer satisfaction is achieved, costs are reduced, productivity is improved and a safe, stable and enjoyable environment is created.

1.3 Research methodology framework

This research was conducted to analyze, investigate, and answer to the following research questions and sub questions:

RQ1: What are the factors that act as enablers and/or inhibitors on the integration of Lean Thinking Principles in the culture of Portuguese Organizations?

sRQ1.1: Is the Organizational Culture an enabler or inhibitor in this integration?

sRQ1.2: Is it more difficult this integration in the departments farthest of operations?

To answer these questions, it was necessary to use a research methodology. The proponent of this thesis designed a framework that includes four phases, as represented in Figure 1.

The first phase was focused on the literature review related to concepts, definitions and models of Organizational Culture and Lean Production. In the second phase, it was developed a questionnaire to study actual practices of organizations to identify the openness to implement Lean and the Organizational Culture predominant type of the organizations. Five organizations were selected based on their relationship with the proponent of this thesis. The questionnaire was important to identify the openness level of the organizations to implement Lean. It was also intended to know the predominant organizational culture embed in the organization. The third phase is the core of the research. In this phase it was developed the theoretical model to integrate Lean Thinking principles in the Organizational Culture of the organization. The last phase is related to the implementation of this model in a case study.

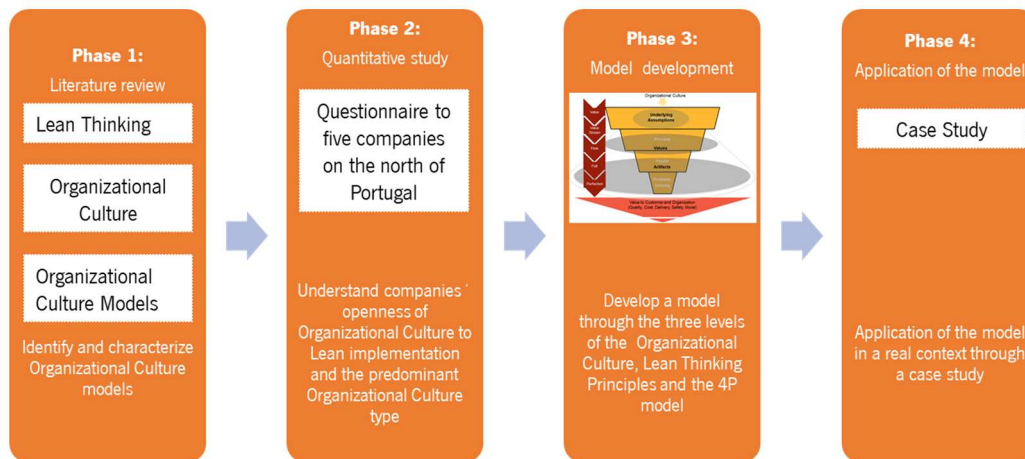


Figure 1 - Research methodology framework

1.4 Thesis structure

The thesis is organized in seven chapters. Chapter 1 presents the introduction and motivation, describes the research background, defines objectives, and presents the research methodology and the thesis structure.

A general review of relevant literature is described in Chapter 2. The chapter presents the main concepts and terms within the research field. First, it is presented Organizational Culture, next the Lean production and then Lean Thinking. This chapter ends with a critical examination of this literature review.

Chapter 3 presents the complete research methodological approach, namely the questionnaire. The questionnaire was applied to quantify the openness of the organization to the implementation of the Lean Thinking on their Organizational Culture and to identify the predominant of Organizational Culture type.

Chapter 4 presents the results achieved by the questionnaires made in five Portuguese companies, located in the north of Portugal. Discussion and conclusions are drawn grounded on the questionnaire's findings.

In Chapter 5 it is presented the theoretical model and wisely described.

In Chapter 6 it is the implementation of the model, describing the process and stages defined in it through a case study. Then, discussion and final considerations are drawn.

The last chapter, Chapter 7, ends the thesis by presenting final considerations, contributions, and discussion of future work.

2. LITERATURE REVIEW

This chapter aims to present the literature review on the thesis topic, to deliver a summary of the main concepts. First, it begins by reviewing each concept involved, namely Organizational Culture, history of Lean Production; definition of Lean Production and Lean Thinking; the principles of Lean Thinking; definition of Culture; Lean Culture; reasons for the need to integrate Lean Thinking in the culture of organizations; difficulties that have been encountered and the benefits for the organizations.

2.1 Organizational cultures and work organizational models

This section introduces some Organizational Cultures discussed in the literature, detailing two main models: from the Denison and Neale authors and Cameron and Quinn authors. Then, it briefly presents some work organizational models, synthetizing their main objectives and differences. Finally, it presents other models and approaches that are being in discussion.

2.1.1 Organizational Culture models

Organizational Culture (OC) was defined by Schein in 1983 as *“...the pattern of basic assumptions that a given group has invented, discovered, or developed in learning to cope with its problems of external adaptation and internal integration - a pattern of assumptions that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems.”* (Schein, 1983, p. 14). This definition, probably, was one of the first formal definition, as this author was the first to noticed this pattern (Schein, 1988). According to this author, organization's culture born in the head of its founder and his/her ideas about truth, reality, and the way the world works.

According to some authors, namely, Glynn et al. (2018) and Teehankee (1993) the interest on Organizational Culture started in the seventies. For example, in 1979, Pettigrew (1979) published the paper “On studying Organizational Cultures” where he developed a longitudinal study in a school. According to Schein (E. Schein, 1988), this interest began when a new management style emerged: the Japanese management style (Culpan & Kucukemiroglu, 1993; Schein, 1984; Szostak, 1984). This was reinforced by Teehankee (1993).

Goffee and Jones (1996) considered that cultures of management type reflect the sociability and solidarity. These are related to “what holds the organization together” (Goffee & Jones, 1996). According to them, high sociability leads to better collaboration, information sharing and openness to new ideas.

However, it could also have disadvantages, e.g., the friendship environment created could inhibit discussion. Nevertheless, when the organization members felt they are reflected in the Organizational Culture, the work atmosphere tends to be more pleasurable, which increased morale (Demir et al., 2011).

According to Demir et al. (2011), Singh (2007) and Wilkins and Ouchi (1983) the identification of the members of an organization with the Organizational Culture create a positive image and commitment that could outperform others with non-existent culture. With this, the organization performance is also influenced, which gives more importance to the need to study it (Calori & Sarnin, 1991; Cheng, 1989; Demir et al., 2011; Scott et al., 2003; Warrick, 2017).

This shows the richness of an Organizational Culture and, at the same time, the difficulty to understand, manage and change it. It also explains why so many different terms/designations are used to name “Organizational Culture”, but, many times, wrongly used (Schein, 1986). The first and perhaps the most important point is that probably no one cannot really understand another culture at the level of its basic world view (Schein, 1981). According to this author, Organizational Culture has not been adequately known in the organizations and different cultures could be found.

Therefore, Organizational Culture should be addressed seriously Schein (1986), because it implies a change process. This change is related to the culture modification and transformation and when this happen, involving or not the affected ones, could counter strong resistance (Schein, 1984). Dyer (1983) considered that to modify a culture, seven steps are necessary: (i) culture audit (diagnosis); (ii) cultural assessment and need for change determination; (iii) cultural risk assessment; (iv) cultural pattern unfreezing; (v) cultural elite elicit support; (vi) intervention strategy selection; and (vii) monitoring and evaluation. So, knowing the Organizational Culture is vital and can decrease the risk of failure (Schein, 1981; Schwartz & Davis, 1981).

As can be seen, to change a culture, an organized complex set of trade-offs among structure, systems, people and culture is implied (Schwartz & Davis, 1981). A lot of aspects are related to and influenced an Organizational Culture, namely: groups, dynamics, strategies, philosophy, leadership, habits, paradigms, sociability, socialization, solidarity, models, traditions, climate, skills, norms, change, behavior, patterns, among others.

From the above, it is recognized that Organizational Culture is a complex interlinked concept that is not immediately recognized or identified. This means that the change requires a huge effort from the organization and is a long-term project coordinated and led by top management (Schwartz & Davis, 1981).

Without a considerable level of agreement on the organizational values, a robust culture does not exist (O'Reilly et al., 1991).

Furthermore, the Organizational Culture concept appeared linked to the Organizational Psychology, Social Psychology, and Social Anthropology (Glynn et al., 2018; Pettigrew, 1979; Scott et al., 2003). Others, specifically, Teehankee (1993), also related it to Organizational and Management Theory, and to the pioneers of the formal study of organizations, such as Max Weber, Henry Fayol and Frederick Taylor (Scientific Management Principles). This author also related it to the Human Relations Movement in organizational studies of Elton Mayo, Abraham Maslow and Douglas McGregor and systems schools promoted by Daniel Katz and R. L. Kahn. Roethlisberger and Dickson (1961) and Parsons (1991), previously noticed these interactions. Other contributions were given to the Organizational Culture definition and understanding (Gorman, 1989; Ott, 1989).

Attending to this, numerous authors from different contexts have been suggesting instruments to diagnose the Organizational Culture (Cameron & Quinn, 2011; Cameron & Quinn, 2006; Demir et al., 2011; Denison & Neale, 1999; Dyer, 1983; Harrison & Stokes, 1992). In such diagnosis one should be conscious that more than one culture, e.g. related to departments or hierarchy, could co-exist within an organization (Cameron & Quinn, 2011; Dyer, 1983).

Thus, Organizational Culture is a very important concept and research topic, being a fertile field in publications, where Schein, Hofstede, and Denison presented three publications within the 25 most co-cited references (Leyva-Duarte et al., 2019). According to the bibliometric study on Web of Science of Leyva-Duarte et al. (2019), they are the principal founding authors of Organizational Culture in the Management of Business economics research area. Table 1 characterizes the models from the three mentioned authors as well as other four models.

Attending to the literature review, some authors, namely, Al-Najem (2012) and Pakdil and Leonard (2015) are relating some of the models defined in the Table 1 to Lean Thinking (section 2.2.2) that is the main core of this thesis. Such models are the models from Schein (Schein, 1988), Denison and Neale (1999) and Cameron and Quinn (2006). This was the reason to select them to base the model and questionnaire developed in this thesis and to deeply discuss in the following sections. More details of this selection will be presented in the research methodology chapter (chapter 3).

Table 1 - Models of Organizational Culture from different authors
(Amaro, Alves & Sousa, 2021)

Author of the model	Dimensions	Elements/ Example
(Handy, 1978) Handy and Harrison Model of Organizational Culture	Power	Characteristic of an entrepreneurial organization, e.g., small start-ups where the power lies with the founder and/or highest boss.
	Role	Highly job-oriented and can often be found in bureaucratic organizations.
	Task	Employees are experienced professionals and are problem-solving oriented. Often deploy temporary teams, in which cooperation is paramount.
	Person	Employees have complete independence, are highly educated and can work with their own expertise, e.g. law firms, health companies or academic research teams.
(Schein, 1983; Schein, 1984, 1988) Three-level model	Artefacts	Visible organizational structures and processes (hard to decipher), observable, e.g. technology, art, office layout, codes dress, public documents, employee orientation, ...
	Values	Strategies, philosophies, espoused justifications and goals, ideals, norms, standards, moral principles, and other untestable premises - with greater level of awareness.
	Underlying assumptions	Taken for granted belief, habits of perception, thought and feeling (ultimate source of values and action), unconscious; those are usually invisible. Refer to beliefs, perceptions and thoughts, often unconscious.
(Harrison & Stokes, 1992) Four-culture model	Power	People are motivated by rewards and punishments and by the wish to be associated with a strong leader.
	Role	People perform specific functions in order to receive defined rewards.
	Achievement	Intrinsic rewards (people like their work, want to make a worthwhile contribution to society, and enjoy interacting with colleagues or customers).
	Support	Mutual trust between the individual and the organization.
(Denison & Neale, 1999) Organizational Culture Model	Mission	Clarity of direction that keeps the efforts of the total group in alignment. Understanding long term direction. Clarity regarding more immediate tasks and actions.
	Adaptability	Ability to create change. Ability to recognize mistakes and learn from them. Capacity to track and respond to changes in the business environment. Willingness to be customer driven.
	Involvement	Workers see a connection between the work they do and the goals of the organization.
	Consistency	Points to how effectively a company organizes and coordinates its different jobs to meet its goals and objectives. How well does its people speak the same language and values.
(House et al., 2004) GLOBE	Uncertainty Avoidance	The extent to which members of an organization or society strive to avoid uncertainty by relying on established social norms, rituals, and bureaucratic practices.
	Power Distance	Degree to which members of an organization or society expect and agree that power should be stratified and concentrated at higher levels of an organization or government.
	In-Group Collectivism	Degree to which individuals' express pride, loyalty, and cohesiveness in their organizations or families.
	Institutional Collectivism	Degree to which organizational and societal institutional practices encourage and reward collective distribution of resources and collective action.
	Gender Equalitarianism	Degree to which an organization or a society minimizes gender role-differences while promoting gender equality.
	Assertiveness	Degree to which individual in organizations or societies are assertive, confrontational, and aggressive in social relationships.
	Future Orientation	Degree to which individuals in organizations or societies engage in such behavior as planning, investing in the future, and delaying individual or collective gratification.
	Performance Orientation	Degree to which an organization or society encourages and rewards group members for performance improvement and excellence.
	Human Orientation	Degree to which individuals in organizations or societies encourage and reward individuals for being fair, altruistic, friendly, generous, caring, and kind to others.
(Cameron & Quinn, 2006) Competing values framework (CVF)	Clan (collaborate)	Commitment, communication, development.
	Market (compete)	Market share goal, achievement, profitability.
	Adhocracy (create)	Innovative outputs, transformation, agility.
	Hierarchy (control)	Efficiency, timeliness, consistency, and uniformity.
(Hofstede, 2011) The 6-D model	Power distance	Different solutions to the basic problem of human inequality.
	Uncertain avoidance	Level of stress in a society in the face of an unknown future.
	Individualism vs. Collectivism	The integration of individuals into primary groups.
	Masculinity vs. Feminist	The division of emotional roles between women and men.
	Long term vs. Short term orientation	The choice of focus for people's efforts: the future or the present and past.
	Indulgence vs. Restraint	The gratification versus control of basic human desires related to enjoying life.

2.1.1.1 Schein model

The Schein's definition of Organizational Culture was calling the attention of the scientific community to the emergence of a new management style: the Japanese style. Schein is considered one of the most important experts in organizational change and most cited in this subject.

Schein (1988) developed a model that includes three levels (Artifacts, Values and Underlying assumptions), Figure 2.

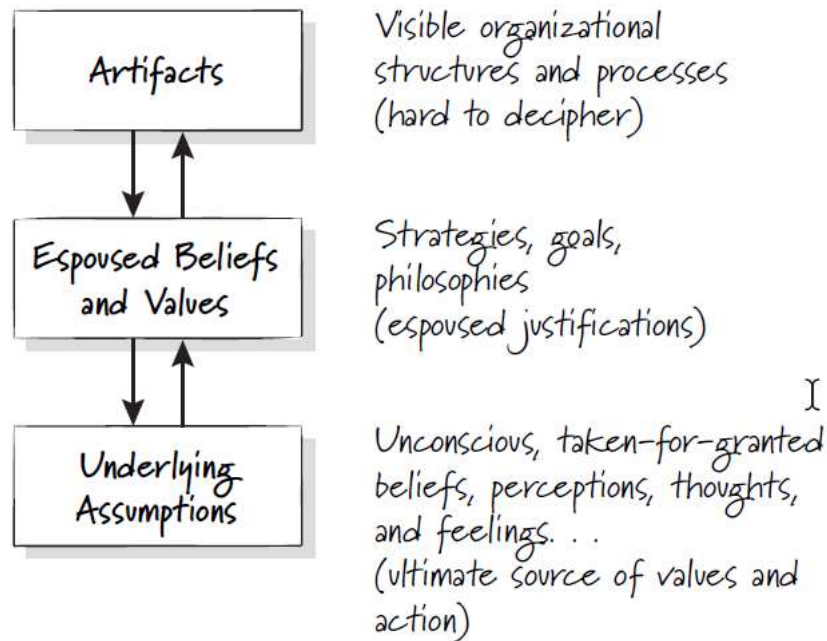


Figure 2 - Levels of Culture
(Schein, 2004)

As Schein said the term level is the meaning of the degree to which the cultural phenomenon is visible to the observer. On first level (Artifacts) is where are documented the visible products of the group, "*such as the architecture of its physical environment; its language; its technology and products; its artistic creations; its style, as embodied in clothing, manners of address, emotional displays, and myths and stories told about the organization; its published lists of values; its observable rituals and ceremonies; and so on*" (Schein, 2004, p. 25).

In this level the things to document are both easy to observe but very difficult to decipher. As it is difficult to decipher, during this documentation phase is necessary translate the visible products of the group (artifacts) into clear assumptions recognized for all the group. With these clear assumptions, it is possible to proceed to the second level (Espoused Beliefs and Values). In this second level, it is important to analyze if the assumptions are aligned with Beliefs and Values of the organization. On the third level, it

must be analyzed the level of congruence of the Espoused Beliefs and Values with the Underlying Assumptions.

The presence/absence of elements of the levels could indicate different culture of management, even, inside the same organization. For instance, Schein (1996) distinct three cultures of management: (i) the “operators” – who make and deliver products; (ii) the “engineers” – who design and monitor the technology and what organization does; and (iii) the “executives” – who do the financial accountability. Numerous times, these three work independently and learn differently, thus inhibiting the organization to act as a unit and obstructing efficiency and effectiveness (Schein, 1996).

The strength and degree of integration of a culture is a function of the stability of the group, the length of time the group has existed, the intensity of the group's experiences of learning, the mechanisms by which the learning has taken place, i.e., positive reinforcement or avoidance conditioning, and the strength and clarity of the assumptions held by the founders and leaders of the group. Also note that the learning occurs both with respect to external survival issues and internal integration issues, and that it covers perceptual, cognitive, and emotional responses (Schein, 1988).

2.1.1.2 Denison model

As seen in the Table 1 above, the fourth model is the model from Denison and Neale (1999). This model is based in four traits: i) Mission, ii) Involvement, iii) Consistency, and iv) Adaptability. Each trait has three indexes that are represented in Table 2.

Table 2 - Dimensions and traits of Denison model

Trait	Indexes
Mission	<ol style="list-style-type: none"> 1. Strategic Direction & Intent: creating multi-year strategies so that priorities are established to make the vision come true; 2. Goals & Objectives: means creating short-term, specific goals established that help employees see how their daily activities connect to the vision and the strategy; 3. Vision: here is the ultimate reason why you are in business – your purpose – what you are trying to achieve.
Involvement	<ol style="list-style-type: none"> 1. Empowerment: they have defined areas where employees can make decisions and where they can't; 2. Team Orientation: employees support each other in achieving goals and teamwork is encouraged; 3. Capability Development (training, coaching, and trying new roles and responsibilities are ways of developing new competencies).
Consistency	<ol style="list-style-type: none"> 1. Core Values: a clear set of core values help to make consistent decisions and behave in a consistent manner; 2. Agreement: through dialogue and getting multiple perspectives on the table people can reach agreement in case of difficult issues; 3. Coordination & Integration: employees understand how their work impacts others and vice versa. They make sure that work is coordinated to serve the organization.
Adaptability	<ol style="list-style-type: none"> 1. Creating Change: welcoming new ideas, being willing to try new approaches to doing things, see creating change as part of running a business; 2. Customer focus: employees serve internal and external customers and look for new and improved ways to meet customer expectations; 3. Organizational Learning: gaining knowledge from successes and failures, and thoughtful risk taking. The reaction to reasonable mistakes is ‘What can we learn?’.

Through a questionnaire, the Denison model analyze the Organizational Culture of the organizations that involve the four traits and respective indexes (Denison & Neale, 1999). Such dimensions are described next.

With the trait Mission, it is intended to analyze how the direction and goals that serve to define an appropriate course of action for the organization and its members were captured. It is important to appraise the organization to examine whether employees are conscious of the company's direction in terms of the clarity about their strategy, mission, and direction of work. Furthermore, it must be verified if the organizational goals are clear and agreed upon by employee, if the goals set by leaders are attainable and realistic. Whether there is a key indicator to show how distant the company is from attaining their goals and to verify if the people involved are held of what needs to be done to achieve the goals. Lastly, it is also essential to verify whether vision is explained clearly to employees and know if it is clearly broken down in short- and long-term goals.

The trait Involvement strongly encourage employees' involvement and create a sense of ownership and responsibility (Denison & Neale, 1999). On Involvement, empowerment and training are crucial. This trait illustrates the degree of people's involvement in their work. Numerous questions could be questioned to measure involvement. For example, where the decisions are completed in department or derive from top management to down? Is information straightforwardly and timely accessible to people? Do workers have confidence themselves for making constructive impact on company? Do people become involved in business planning? An organization must always attempt to learn from failure. In addition, there should be a scheme of incentive and reward to encourage people coming up with innovative ideas.

The trait Consistency provides a central source of integration, coordination, and control (Denison & Neale, 1999). Consistency looks to teamwork and inter-departmental relation. Here is important to see whether organizations are consistent in solving problems, and the behaviors of dealing with any divergence occurred within a particular department. How an organization establishes consistency in its principles and practice? How many perspectives are work together into a common goal?

The trait of Adaptability is related to how the organizations embrace a system of norms and beliefs that support the organization's capacity to obtain, interpret, and translate signals from its environment into internal behavioral fluctuations that rise its chances for survival, growth and development (Denison & Neale, 1999). On Adaptability, it is important to have a good relationship with customer and supplier. Here, is predictable to know the ability of an organization to response to its customer variation and market request, whether the organization has flexibility, whether there is support between departments in an

organization mostly when change is obligatory. This adaptability gives more results when the organization pays attention to its customers by understanding their needs, by their feedback and when employees are aware of customers' needs.

These traits have a significant correlation with sales growth, profits, quality, employee satisfaction, and overall performance. The Figure 3 summarizes the correlation between the cultural traits and organizational effectiveness measures. The direct impact is not immediately achieved and may take some years, or even decades, to see the results. This happens because this is about Organizational Culture change and examples from Toyota show this.

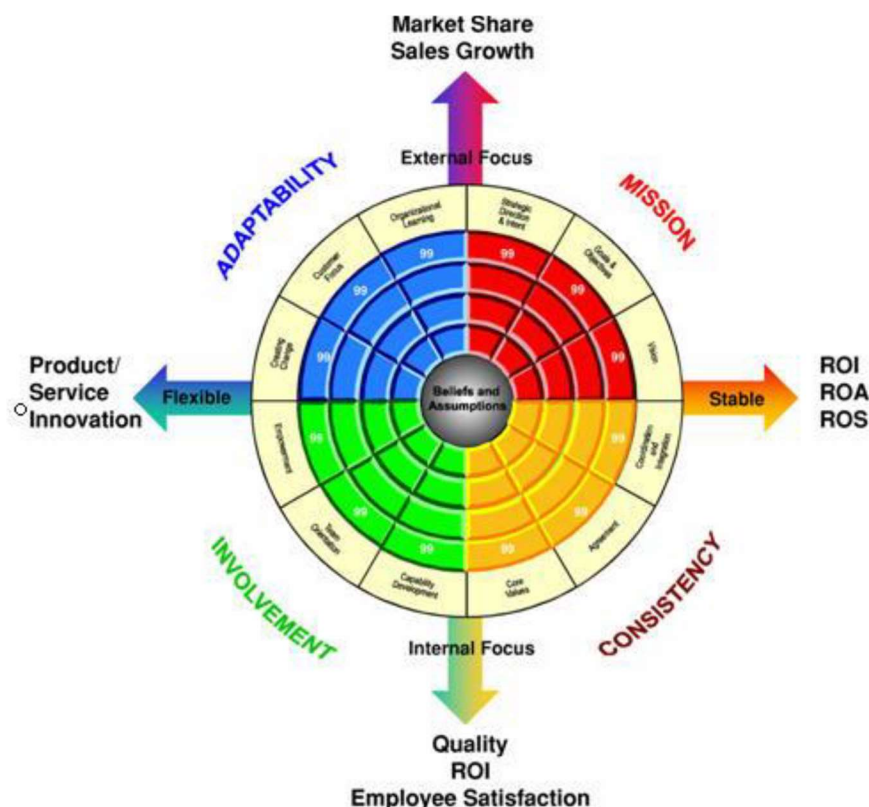


Figure 3 - Correlation between the cultural traits and organizational effectiveness measures (Denison & Neale, 1999)

Using data from 764 organizations, Denison et al. (2004) verified that the four different cultural traits (mission, consistency, adaptability, and involvement) were indeed related to different criteria of effectiveness. Their research found that the traits of mission and consistency were the best predictors of profitability, the traits of involvement and adaptability were the best predictors of innovation, and the traits of adaptability and mission were the best predictors of sales growth.

Later on, Denison et al. (2014) evaluate the criterion-related validity of the indexes from the Denison Organizational Culture Survey as organization-level predictors of effectiveness using subjectively rated indicators. Correlations between the culture traits and ratings of sales growth, market share, profitability,

quality of products and services, new product development, employee satisfaction and overall performance are presented in Figure 4, based on data provided by Denison et al. (2014).

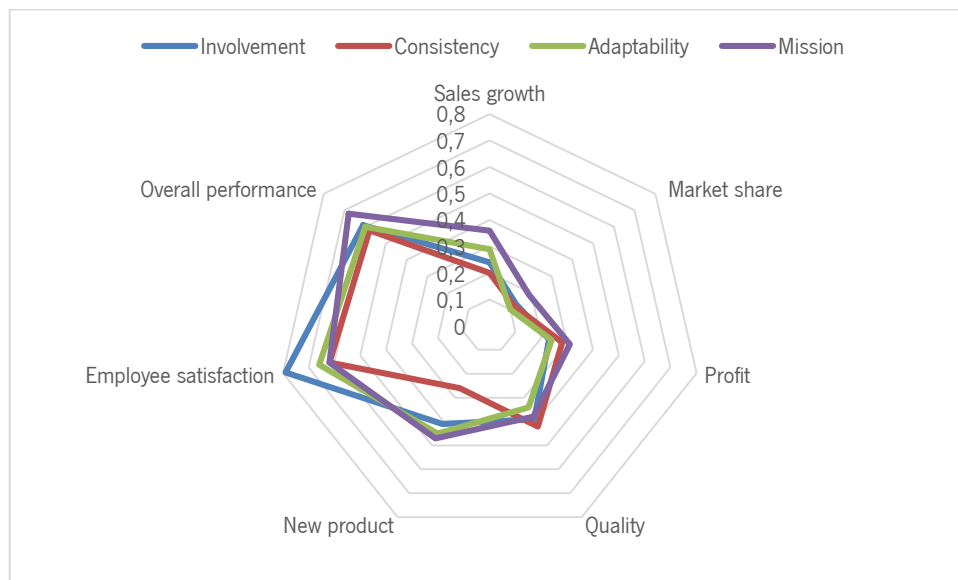


Figure 4 - Correlations between the Culture Traits and Subjective Effectiveness Measures (adapted from Denison et al., 2014)

The Figure 5 shows the correlations between the culture indexes and ratings of sales growth, market share, profitability, quality of products and services, new product development, employee satisfaction and overall performance based on the same data from Denison et al. (2014).

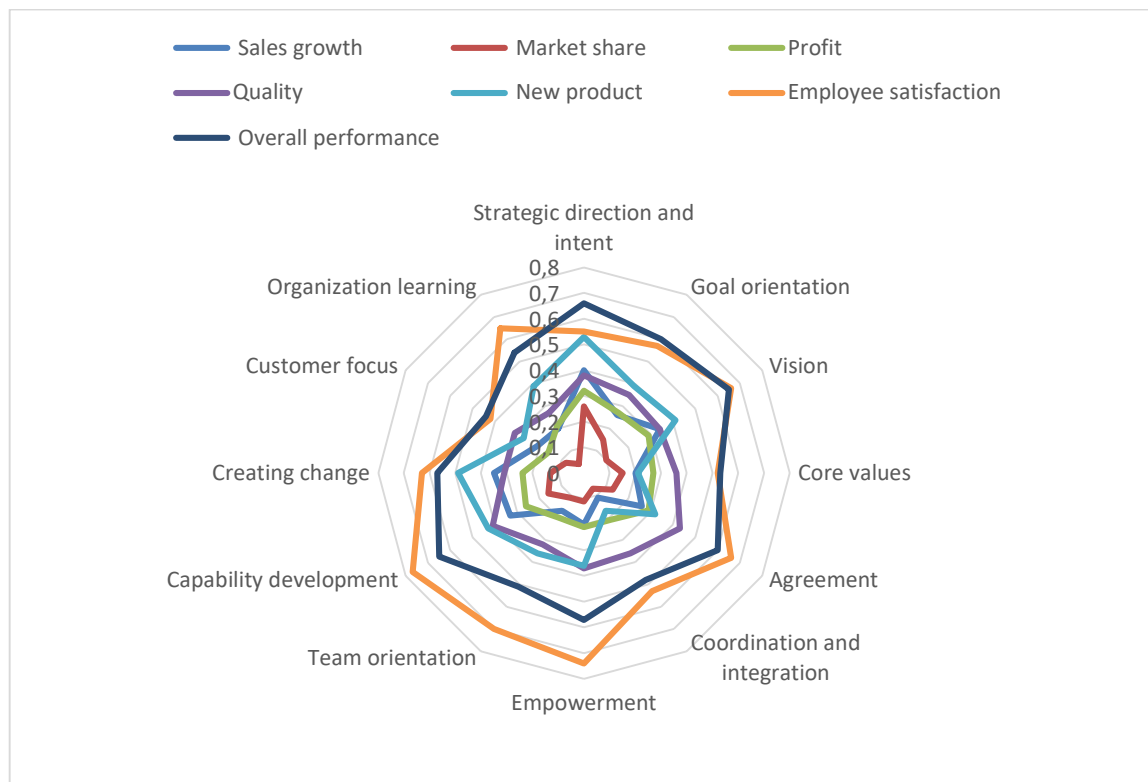


Figure 5 - Correlations between the indexes and indicators of organizational effectiveness (adapted from Denison et al., 2014)

2.1.1.3 Cameron and Quinn model and Competing Values Framework

Organizational Culture covers a complex, comprehensive, interrelated, and ambiguous set of factors. For this reason, when diagnosing and assessing organizational culture it is not possible include all relevant factors.

Cameron and Quinn (2006) created the Organizational Culture Assessment Instrument (OCAI) to measure the organizational culture. In this instrument, it is used a framework called Competing Values Framework (CVF). CVF uses two logical dimensions in a Cartesian graph: i) first dimension, the y-axis, distinguishes effectiveness criteria in flexibility and discretion in contradiction of stability and control; ii) second dimension distinguishes internal focus and integration against external focus and differentiation. The Figure 6 shows that the combination of these two dimensions forms four quadrants, which state core values upon which judgments are made in an organization (Cameron & Quinn, 2006).

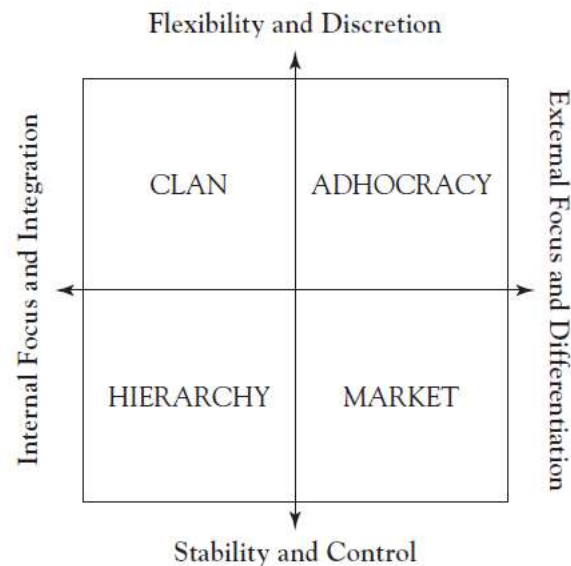


Figure 6 - The Competing Values Framework
(Kim S. Cameron & Quinn, 2006)

The conflicting values (“competitors”) in this model are characterized by the diagonal quadrants. These values advocate the model’s name, CVF. Each of these quadrants, in turn, defines the dominant profile of a particular type of Organizational Culture: Adhocracy, Market, Hierarchy and Clan Culture, succinctly described in Figure 7.

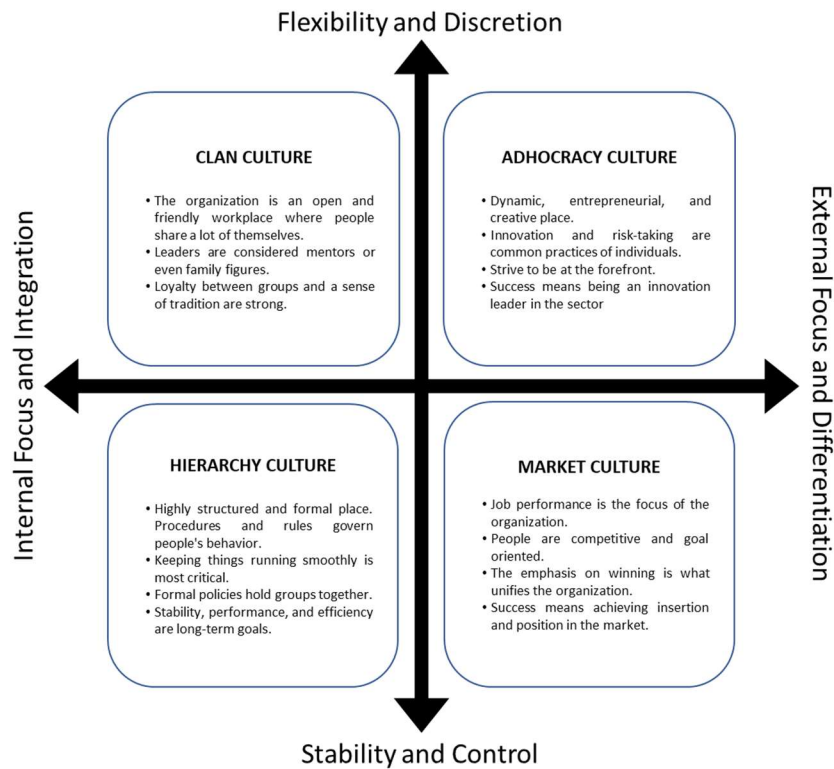


Figure 7 - Organizational Culture Profile
(adapted from Cameron & Quinn, 2006)

To define the profiles, the organizations must fill out a questionnaire that will highlight aspects of organizations' culture to identify dominant culture type. The questionnaire includes six individual items: i) Organizational/Dominant Characteristics, ii) Organizational Leadership, iii) Management of Employees, iv) Organizational Glue, v) Strategic Emphases and vi) Criteria of Success (Table 3).

Table 3 - Definition of the Organizational Culture Assessment Instrument individual items

Items	Definition
Dominant Characteristics	Dominant characteristics of the organization, or how the organization is characterized overall.
Organizational Leadership	The leadership style and approach inherent in the organization.
Management of Employees	Employee management or the style that characterizes how employees are treated, and the working environment is characterized.
Organizational Glue	The organizational 'glue' or bonding mechanisms that hold the organization together.
Strategic Emphases	Define which areas of emphasis to target in the organization's strategy.
Criteria of Success	Determine how victory is defined and what is rewarded and celebrated.

This framework indicates the dominant profile, allowing understanding if it is the most adequate profile to allow long-term success and sustainability in Lean growth and application (Paro & Gerolamo, 2017). The responses to the six items: Dominant Characteristics, Organizational Leadership, Management of Employees, Organizational Glue, Strategic Emphasis and Criteria of Success, help to highlight aspects of organization's culture that identify its dominant culture type.

The Clan Culture emphasizes the employee involvement and teamwork. The Hierarchy Culture emphasizes control, standardization, and predictable performance outcome techniques. The Adhocracy

Culture emphasizes creativity, problem-solving processes, and decentralization. The Market Culture emphasizes efficiency, productivity, and continuous quality improvement.

The core values presented early in each type of culture are the main concerns because of the choice the type(s) of predominant Organizational Culture. The analyses of the six individual items will permit verify if the predominant Organizational Culture is congruent. To help this analysis, Table 4 presents the characterization of each individual profile by each kind of culture.

Table 4 - Characterization of each individual profile by each type of culture
(adapted Cameron & Quinn, 1999)

Culture type	Profile items	Description
Clan	Dominant Characteristics	A very personal organization, like a big family. Individuals feel they can share their problems.
	Organizational Leadership	The leader of the organization is a mentor, a facilitator, almost a parental figure.
	Management of Employees	The management style in the organization is characterized by teamwork, consensus and participation.
	Organizational Glue	The basis on which the organization is maintained is loyalty and implication, cohesion and teamwork being characteristic of this type of culture.
	Strategic Emphases	The atmosphere in the organization is pleasant and participative. There is a great deal of openness and trust.
	Criteria of Success	Success is measured on the basis of human resource development, teamwork and caring for people.
Hierarchy	Dominant Characteristics	The organization is very structured and formalized. Bureaucratic procedures usually govern what people do.
	Organizational Leadership	The leader is usually designated as being a coordinator or an efficient technician.
	Management of Employees	The management style is characterized by job security, job tenure and predictability.
	Organizational Glue	The governing principles of the organization are formal principles, detailed rules and procedures. It is important to maintain smooth, regular functioning.
	Strategic Emphases	The climate is characterized by rigor and clarity. Procedures are clear.
	Criteria of Success	The organization defines success based on efficiency. Low production costs and guaranteed on-time delivery of products are key points.
Market	Dominant Characteristics	The organization is very competition-oriented. The main concern is to get the job done well. Individuals are oriented towards high performance and high productivity.
	Organizational Leadership	The leader is generally regarded as a great director, productive and competitive.
	Management of Employees	The management style in the organization is characterized by strong competitiveness, production and performance.
	Organizational Glue	The concern with production and the achievement of objectives are the fundamental principles that govern the organization. An aggressive positioning in the market is emphasized.
	Strategic Emphases	The organization's climate is competitive and therefore conducive to conflict. The victory over the competition is emphasized.
	Criteria of Success	The organization determines success on the basis of market share and penetration. The key objective is to beat the competition.
Adhocracy	Dominant Characteristics	The organization is very dynamic and entrepreneurial. People are willing to take risks.
	Organizational Leadership	The leader is generally regarded as an entrepreneur, an innovator or an individual who accepts challenges.
	Management of Employees	The management style is characterized by individual initiative, innovation, freedom and originality.
	Organizational Glue	The basis on which the organization is maintained is a concern for development and innovation.
	Strategic Emphases	The organization's climate is characterized by innovation, creativity and a willingness to face new challenges. Change and development are stimulated.
	Criteria of Success	Success is measured on the basis of having unique and innovative products. The organization is innovative and has market-leading products.

2.1.2 Work Organizational models

The Organizational Culture is related to Work Organizational models or Organizational and Management Theory, as seen in the previous section. Before to define Work Organizational models is important to define Work Organization. According to the Eurofound (2021) *“Work organization is about the division of labor, the coordination and control of work (...). Work organization thus refers to how work is planned, organized and managed within companies and to choices on a range of aspects such as work processes, job design, responsibilities, task allocation, work scheduling, work pace, rules and procedures, and decision-making processes”*.

So, a Work Organizational model is a form to organize the work and there are a few different models: Craftsmen, Taylorism/Fordism, Lean Production, Socio-technical or Scandinavian and Agile Manufacturing. Table 5 summarize the main characteristics of most referenced Work Organizational model, based on Krafcik (1988); Graça (2002); Alves et al. (Alves et al., 2012) and Bittencourt et al. (2019).

Table 5 - Characterization and comparison of Work Organizational models

Characteristics	Craftsmen	Taylorism/Fordism	Socio-technical system	Toyota Production System/Lean	Agile Manufacturing
Philosophy	Functional	Hierarchical and functional objective: “good enough”; technocentric system	Simple structure, reduced hierarchical levels; anthropocentric system	Divided responsibility pursuit perfection	Human networking organization
Teamwork and organization of people	Low, specialist, artisan work	Low, individual work under supervision of managers	Medium; autonomous teamwork with a team leader	High, autonomous teamwork, following standard work instructions that workers can improve	High; autonomous groups and empowerment of all people in the enterprise;
Span of control	Wide	Narrow	Low	Moderate	Low
Production	Customized products	High volumes and low diversity, standard products, mass production	Customized products	Customized products	Customized products, mass customization

Some authors used different terminology to refer to these models, for example, Womack and Jones (1994) named them as Industrial Traditions designating the American, the Japanese and the German Traditions.

The Work Organizational model is strictly related to the production system layout (Carmo-Silva et al., 2006). According to Black (2007) the production system of craftsmen model does not to be designed. The artisans produce the on-demand customized product from the first part to the final using their rudimentary tools. Blacksmiths, tailors, shoemakers are some examples of this model.

The final of nineteenth century represented the beginning of first industrial revolution that partially provoked a deep social transformation, substituting man by machines in the rural activities and allowing the creation of factories in the cities organized in a job-shop production system (Carmo-Silva et al., 2006). Rural people abandoned the fields and came to the new cities looking for new opportunities in these big factories. However, these people did not have the knowledge and training of specialist in working with heavy machinery.

With the creation of Principles of Scientific Management (Taylor, 1911), already in the second industrial revolution, Taylor created the basis for a simple production system where any person could do simple tasks. Due to the principle of work division, which splits the operations into elementary tasks allow that anyone could perform the task and allows to give work to many unqualified human resources. Each worker stays always in one workplace, performing his simple repetitive task, within a standard time formerly estimated by the time and methods staff. For this, an assembly moving line was designed that allowed mass production and an economy of scale. Henry Ford employed many people in his automobile factory by adopting the Principles of Scientific Management. He was able to improve productivity (when compared to traditional craft production) and to produce large quantities of his famous car model (Alves, Dinis-Carvalho, et al., 2012).

In a contrary movement, it appeared the Social-Technical System (STS) which the best-known examples of the application are the Volvo automobile factories from Udevalla and Kalmar from Sweden (Graça, 2002). Attending to these paradigmatic examples, this model is also known by “Volvoism” model. This is considered an Anthropocentric Production System, to distinguish from the Techno-Centric System previously described, as the people are in the center of the system.

The STS indorses the worker’ qualification, collaboration, flexibility, and the empowerment of team members organized in Semi-Autonomous Work Groups (SAWG) or Self-Directed (or self-managed) Work Teams (SDWT). This organization was the base for the STS Work Organization model (van Amelsvoort & Benders, 1996). In this model, each team was responsible for the whole assembly of the car. The democratization, the self-management, the contribution of all associates in the local decision-making (previously assigned to supervisors or managers), were fundamental characteristics of these teams (Alves, Dinis-Carvalho, et al., 2012). The utilization of skilled human resources and flexible technology adapted to the needs of a flexible and participative organization (Kovács, Ilona and Moniz, 1994).

The Toyota Production System is the root of Lean Production where responsibility was shared and perfection through continuous improvement was pursued. Teamwork was also a prerogative, but the

workers must follow standard work instructions that can be improved. According to Black (2007), Toyota Production System is organized in Linked-Cell Manufacturing system that characterizes the production system for third industrial revolution. Indeed, Alves et al. (2015) studied some organizations that reconfigured their production systems, mainly, from job-shop to cells. Such cells produce less quantities than production lines but offers more variety that serves better an economy of scope. TPS increases the flexibility in product configuration, increases the product quality, and led to a further cost reduction of the products (Shah & Ward, 2003). This Work Organizational model is deeply discussed in the section 2.2.

Another concept that was originated in the 1990s is Agile Manufacturing (Kidd, 1995), introduced by a report from Iacocca Institute about the twenty-first Century Manufacturing Enterprise Strategy (Gunasekaran, 2001; Hormozi, 1994). According to Lindberg (1990), this concept emerged due to the acceleration of globalization which demands a proactively action from manufacturing companies to the market and a corporate-wide flexible strategy to respond quickly to fast-changing markets driven by customer-based valuing of products and services.

To Sharifi and Zhang (2001), the main objective of Agile Manufacturing is to develop responsiveness. For them, high flexibility can be realized in production configuration, in deliverability and quantities of the products, not being always cost-effective, but this flexibility enables companies to gain market responsiveness through some strategic utilization of managerial and manufacturing methods. This means that Agile Manufacturing enables an organization to achieve rapid response to customer needs. It also enables the quick reconfiguration of operations and strategic alliances, to rapidly comply with unpredictable market changes (Gunasekaran, 2001).

This Work Organizational model is suitable for the “mass customization” paradigm. Mass customization satisfies unique customer requirements specified via a product configurator. In the context of Industry 4.0 (Kagermann et al., 2013) or fourth industrial revolution this paradigm become more achievable through the new wireless communication technologies and smart manufacturing concept. Even, more recent, are the concepts of Society 5.0 (Ferreira & Serpa, 2018; Keidanren, 2018; Komiyama & Yamada, 2018; Nakanishi, 2019; Pereira et al., 2020) and Industry 5.0 (Breque et al., 2021) that brings new challenges to the Work Organizational.

The concept Society 5.0, originated from Japan, is a strategy to deal with the impact of an ageing population (Pereira, Lima, and Charrua-Santos 2020). According to a publication in the World Economic Forum meeting *“People will be expected to exercise rich imaginations to identify a variety of needs and challenges scattered across society and the scenarios to solve them, as well as creativity to realize such*

solutions by using digital technologies and data. Society 5.0 will be an Imagination Society, where digital transformation combines with the creativity of diverse people to bring about "problem solving" and "value creation" that lead us to sustainable development. It is a concept that can contribute to the achievement of the Sustainable Development Goals (SDGs) adopted by the United Nations." (Nakanishi, 2019).

Industry 5.0 (Breque et al., 2021) is an initiative recently launched by the European Commission that is like an European response to the concept of Society 5.0. For these authors, Industry 5.0 *"... will be defined by a re-found and widened purposefulness, going beyond producing goods and services for profit. This wider purpose constitutes three core elements: human-centricity, sustainability and resilience"* (Breque et al., 2021, p. 13).

2.1.3 Other models and approaches

This section introduces some models and approaches that have been appearing in the literature such as Learning Organization and Value Stream Organizations.

2.1.3.1 Learning Organization

Learning Organization (LO) as defined by Senge (1990, p. 8) is *"...where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together"*. To build such organization, Senge (Senge, 1990) considered the use of five "component technologies": 1) systems thinking, 2) personal mastery, 3) mental models, 4) shared vision, and 5) team learning.

This definition is much related to learning that is a key concept for the Learning Organization. Without learning, organizations cannot survive, improve or growth. For this reason, de Geus (1997) considered LO as a "The Living company". This author referred that companies born, live and die as a living organism. According to him, organizations have a short lifetime cycle due to the managers who focus their attention only on the production of goods and services. The managers forgot that an organization is also a community of people. This means that to stay alive they need to be sensitive and adaptable to the world around. In addition, the organization needs to take conscience of its identity, making people feel part of the whole and being receptive to new ideas, promoting this way the innovation and a cycle of continuous learning. This continuous learning drive companies to the continuous improvement, there must be a *"commitment to learning"* (Garvin, 1993).

In this similar vein of thinking, some authors discuss the "Knowledge-creating company" (Nonaka, 1991). This means that organizations need to organize the learning and knowledge, i.e., they need to manage

the knowledge they acquire (Nonaka et al., 1996). This knowledge acquisition and organization is related to organizational learning as a process. Organizational learning has also been discussed by many authors (Argyris & Schön, 1978; Chris Argyris, 1976; Edwards, 2009; Fiol & O'Connor, 2017; Huber, 1991). This knowledge organization will avoid incongruent actions, i.e., what people think and do is quite different and at the same time, different people has different mental models, so they will do and act differently for the same situation (Argyris, 1976; M. L. Emiliani, 1998; Flumerfelt et al., 2016; Flumerfelt et al., 2014; Senge, 1990).

In the past few decades, the development of Learning Organizations has been theme of ample research. Over the time, researchers have attempted to determine how to enhance company's Learning Organization capabilities (Tsang, 1997; Yang et al., 2004). The researchers also invested much energy on studying how they are related with existing management approaches (Chang & Lee, 2007; Ellinger et al., 2002) and workplace practices (Marsick & Watkins, 2015).

It is recognized as a key factor for organizations competitiveness the development of intrinsic capabilities that promote learning and knowledge sharing across organizations. This is independent of the involved management method or workplace practices (Tortorella et al., 2020).

To measure the return of the Learning Organizations, few researchers have proposed diverse instruments to assess the progress of learning capabilities. Huber (1991) is one of the first authors to discuss the organizational learning subject, grounded on four major processes: information acquisition, information distribution, information interpretation, and organizational memory.

Some authors created a tool, e.g. questionnaires, to measure Learning Organization capabilities (Kim et al., 2017; Palos & Veres Stancovici, 2016; Ponnuswamy & Manohar, 2016; Tortorella et al., 2015; Tortorella & Fogliatto, 2014), which rises its experiential validity and consistency, and highlights its academic bearing.

2.1.3.2 Value Stream Organizations

To arrive to new levels of performance, organizations need to move from local view to a value stream view. Value means all activities that the client is willing to pay for. The value stream is the set of all activities both add and non-add value. Most organizations, with a primary focus on disconnected islands of improvement, jump sequentially from one improvement program to the next, using several tools, disconnected from the whole, achieve limited results. To support the visualization and quantification of the value stream, Rother and Shook (2003) created a tool named Value Stream Mapping (VSM). This tool has been helping organizations to see improvement opportunities integrated on the value stream.

The value stream analysis push to a holistic view of the value chain and leads to a better understanding of complex relations between its components. Value stream analysis should be the natural behavior of the organizations. That requires a radical change which involves a total redesigning of purpose, system, and culture of the organization (Hines et al., 2004).

Value stream concept is the origin of a model called Value Stream Organizations (Mascitelli, 2007). The Value Stream Organization is an organization model that is based on product value stream. Each value stream includes all the technical and operational resources necessary to the product or product family (Figure 8). Beyond that, it embraces a functional resource coordinator and a shared resource coordinator that serves all value streams.

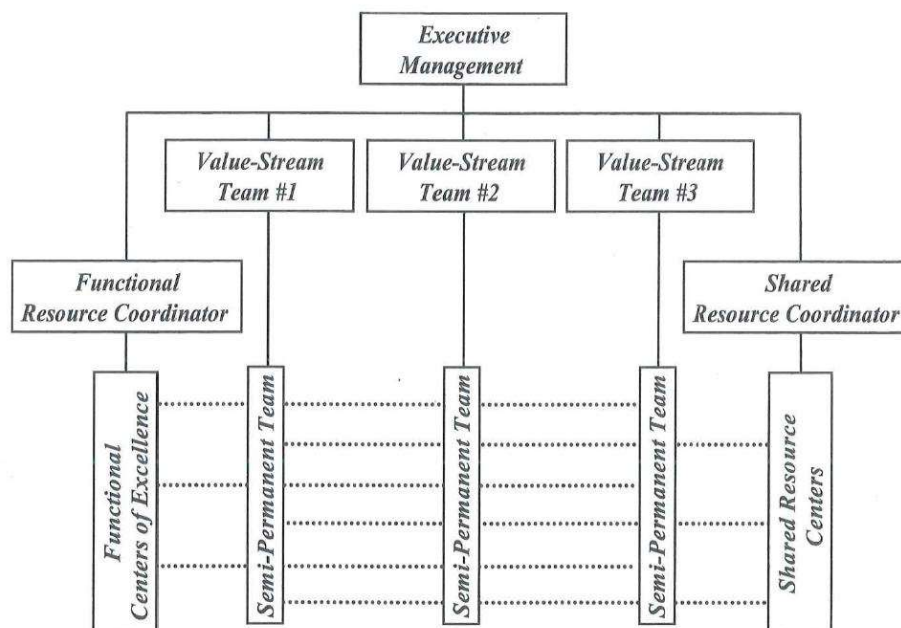


Figure 8 - Representation of a Value Stream Organization (Mascitelli, 2007)

2.2 Lean Production

This section begins presenting the origins and definitions, followed by models for Lean implementation and principles of Lean Thinking. Then, the Enablers vs inhibitors and, finally, the Lean Culture.

2.2.1 Origins and definitions

The origins of Lean Production have the grounding on a sequence of ongoing processes. This ongoing process will be described in the following lines. This process was born out of a need that initiated at the end of the World War II, when Toyoda Kiichiro, president of Toyota Motor Company, noticed that: or they catch up with America in three years, or the automobile industry of Japan will not survive. This is in the

consequence of that period when one American worker produced, approximately, nine times as much as a Japanese worker. For this reason the Japanese looked at American mass production methods (Ohno, 1988).

Toyoda cousins Kiichiro and Eiji, with Ohno, visited American companies to study and learn how to build automobiles using the philosophy of Ford Production System. This study was the base for them to promote their own system, the Toyota Production System (TPS) that adjust it to their market and culture by refining the principles, concepts and tools to imbed in this system. In 1973 started the oil crisis in North America and this situation developed an immense interest in the Japanese manufacturing and in its management practices. This interest generated numerous academic publications and practitioner books and articles.

In 1978, Ohno published the book *Toyota Production System* in Japanese. In this book, he emphasized that Ford Production System and the American supermarket were behind his Just- In-Time (JIT) production (Shah & Ward, 2007). In 1984, Toyota Motor Company and General Motors (GM) created the New United Motor Manufacturing Inc. (NUMMI) joint venture where GM learned the principles underlying Lean Production (Cowger, 2016). In 1985, started the International Motor Vehicle Program (IMVP) study at Massachusetts Institute of Technology (MIT). As a result of this study the term Lean emerged in management lexicon via a researcher from the MIT, named John Krafcik (Holweg, 2007).

John Krafcik (1988) wrote the article “The triumph of the lean production system” where he used the term Lean to describe the Toyota Production System (TPS). But the term Lean is often cited as being made popular by the authors Womack et al. (1990) in the best-seller management book entitled “The Machine That Changed the World”, that was the result of large-scale IMVP study at MIT, referred above. The main conclusion of the researchers that participated in this program was that they found a dramatic performance gap between Japanese and Western car producers. This book prompt curiosity and attention of a lot of researchers (Karlsson & Åhlström, 1996; Katayama & Bennett, 1996; Lewis, 2000; Bhasin & Burcher, 2006; Holweg, 2007; Jasti & Kodali, 2016) and influences greatly management thinking (Samuel et al., 2015).

As Womack said in the book “The Machine That Changed the World” (Womack et al., 1990), the best way to describe Lean Production is to contrast it with craft production and mass production. The craft production uses highly skilled workers to make exactly what the consumer asks for with simple but flexible tools. By craft production, automobiles are exclusive, and the result is a cost too big for the most people to afford. To reduce the cost of the automobiles the mass production was developed.

The mass-producer uses narrowly skilled professionals to design products made by unskilled or semiskilled workers. The machines are single-purpose and too expensive. It works at high volume only with standardized products. Because the changing over to another product at that time was too expensive, mass production adds many buffers (extra supplies, extra workers, and extra space) to assure smooth production. This way consumer gets lower costs but does not have alternative in the choices.

The lean producer, by contrast, combines the advantages of craft and mass production, avoiding the rigidity of the mass production and the high cost of the craft producer. Lean producer can produce low volumes of products in enormous variety by employing teams of multi skilled workers and increasingly automated machines.

In the book of Womack et al. (1990, p.13) Lean Production is defined in terms of its outcomes: “[...] *compared to mass production it uses less of everything – half the human effort in the factory, half the manufacturing space, half the investment in tools, half the engineering hours to develop a new product in half the time.*”

Others authors, namely, Shah & Ward (2007) defined Lean Production as *“an integrated socio-technical system whose main objective is to eliminate waste by concurrently reducing or minimizing supplier, customer, and internal variability”*.

Many times, instead of Lean Production, authors defined Lean Thinking, namely, Joosten, Bongers, & Janssen (2009, p. 343) as *“An integrated operational and sociotechnical approach of a values system, whose main objectives are to maximize value and thus eliminate waste, by creating cumulative capabilities”*.

Both last authors referred are concordant in defining Lean Production or Thinking as an integrated socio-technical system (or approach). Nevertheless, the Lean Thinking is seen as more than a system, is a philosophy where the key concept is value. Value is defined as a capability to deliver to the customer exactly the product or service he wants with minimal time between the moment the customer asks for that product or service and the actual delivery, at an appropriate price (J. P. Womack & Jones, 1996). By defining what customers want, process-steps can be divided in value-added, non-value added but necessary and non-value added.

Value added activities contribute directly to create a product (good and/or a service) a customer wants. Non-value added but necessary activities do not add value but are necessary because it is impossible to eliminate them at the present moment. The endeavor is to try to reduce them and eliminate them as soon as possible. Non-value-added activities do not add value and are called waste or *muda* (in Japanese).

The focus must be to eliminate, remove or avoid *muda* because this means any human activity which absorbs resources but does not add value, like mistakes that require rectification, production of items no one wants, where inventories and remaindered goods pile up, processing steps which are not actually need, movement of employees and transport of goods from one place to another without any purpose, groups of people in a downstream activity standing around waiting because an upstream activity was not delivered on time, and goods and services that do not meet the needs of the customer. The wastes described above were identified as seven types of *muda* by Ohno (1988).

Recently, some researchers, namely, Hopp and Spearman (2021) discussed four lenses of Lean: process, flow, network and organization that are all linked and offer a framework to improve the management system by jointly explore other areas like Data Analytics, Network Science, and Cognitive Psychology.

Also, Cusumano et al. (2021), react to Hopp and Spearman (2021) article and share their perspectives on Lean. Later, Browning and Treville (2021) made a lean view of Lean. These articles have stimulated thinking and encouraged rich debate about Lean. Browning and Treville (2021) encourage the lean community to work together to compile a list of the formal concepts that underlie what Toyota and other organizations have done in search of operational improvements, broadly defined. This set of formal concepts—rigorously defined—will make it possible to explore important tradeoffs across diverse contexts.

2.2.2 Models and principles

There are a lot of models from the TPS founders (Ohno, 1988), from academics (Hines et al., 2008; Hodge et al., 2011; Maia et al., 2012), from consulting companies (Ahrens, 2006; Coimbra, 2009; Flinchbaugh & Carlino, 2006; Rother, 2010; Shook, 2014), and others that intend to implement Lean. Many authors have been discussing and reviewing that, namely, Jasti et al. (2020; 2014) and Maia (2018), thereupon they will not be reviewed on this thesis. However, for this thesis, it is important to highlight two of models that were relevant for the model proposed.

2.2.2.1 Principles of Lean Thinking

Due to many solicitations from companies, requesting guidelines for Lean Production implementation, Womack and Jones defined and published five principles in a new book entitled “Lean Thinking: banish waste and create wealth for your corporation” (Womack & Jones, 1996). Lean Thinking provides a path to specify value, align value-creating actions in the best sequence, conduct these activities without interruption whenever someone requests them, and perform them more and more effectively. The principles of Lean Thinking principles aim to be an antidote to waste (*muda*). The five Lean Thinking principles are:

1. Value;
2. Value Stream;
3. Flow;
4. Pull production;
5. Perfection.

The value specification is the critical starting point, and, for that, the customer's point of view is mandatory. The customer must express value in terms of a specific product (a good or a service, and often both) to meet some needs at a specific price and at a specific moment.

The identification of the value stream, is the identification of all the activities required to produce a specific product, including those not adding value. This vision of the entire process is essential to identify wastes and, consequently, improvement opportunities.

Ensuring flow means that all activities must be carried out smoothly, without interruptions. If, for some reason, an activity stops, it means that there is some kind of *muda* that must be eliminated or reduced.

The implementation of pull means to produce exactly what is necessary (right product and right quantity), when it is necessary (right moment), to fulfil the customer request. In other words, one can say that production is pulled by the customer and avoids the accumulation of Work-In-Process (WIP) and supplies along the productive system.

The pursuit of perfection means the continuous effort towards the complete elimination of *muda*. Ideally, only value-adding activities should exist in the process. It is a journey of continuous improvement. To help implement these principles, Womack and Jones (2003) defined a model called Lean Leap for organizations transformation.

These principles have been applied to different expertise areas from operations to education, leading to designations such as Lean Construction (Koskela, 1992), Lean office (Bicheno, 2008; Tapping & Shuker, 2003), Lean Healthcare (Graban, 2011; Mazzocato et al., 2010), Lean Leadership (Dombrowski & Mielke, 2013; Emiliani, 2008), Lean Product Development (Mascitelli, 2007, 2011; Salgado & Dekkers, 2018), Lean Startup (Ries, 2011), Lean Supply Chain Management (Wincel, 2003), Lean Education/Teaching (Alves et al., 2017; Emiliani, 2015), Lean Project Management (Riis, 1993), among others.

2.2.2.2 Model 4P and 14 Principles of Toyota Way

In 2004, Jeffrey K. Liker wrote a book named The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer (Liker, 2004). He started the book by talking about the Toyota House

model conceived by Fujio Cho, an Ohno disciple, as a house because of the need to have TPS as a structured system and not just a set of tools. In the roof of the house five objectives should be attended: best quality, lower cost, shortest delivery time, best safety, and high moral.

Also, in this book, Liker describes the 14 Management Principles that operationalize all aspects of TPS, originating the 4P model. The 4P model is divided in four levels, all starting with “P” – Philosophy, Process, People and Partners and Problem Solving (Figure 9).

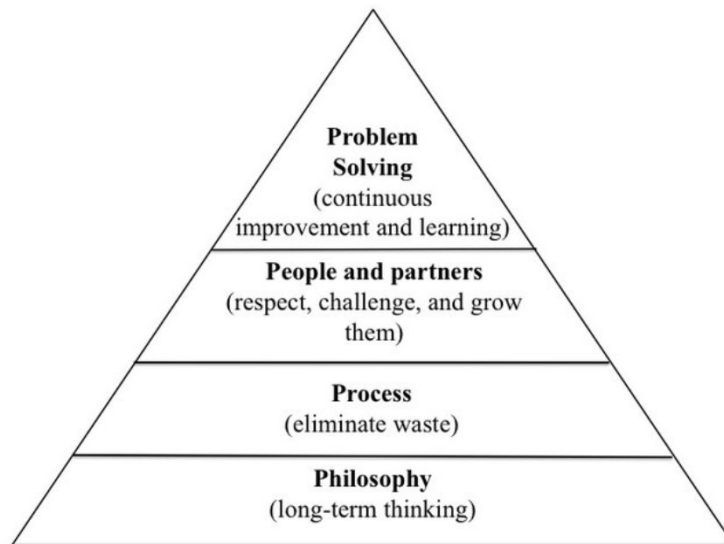


Figure 9 - The 4P Model
(adapted from Liker (J. K. Liker, 2004))

Each of the 14 Management Principles is related to a “P” level. Table 6 shows the distribution of the principles by the levels as referred by Liker (2004).

Table 6 - The 14 Toyota Way Principles
(adapted from Liker (2004))

Level	Principle
1 - Long-Term philosophy	1 - Base your management decisions on a long-term philosophy, even at the expense of short-term financial goals
2 - The right process will produce the right results	2 - Create a continuous process flow to bring problems to the surface
	3 - Use “pull” systems to avoid overproduction
	4 - Level out the workload
	5 - Build a culture of stopping to fix problems, to get quality right the first time
	6 - Standardized tasks and processes are the foundation for continuous improvement and employee empowerment
	7 - Use visual control so no problems are hidden
	8 - Use only reliable, thoroughly tested technology that serves your people and processes
3 - Add value to the organization by developing your people	9 - Grow leaders who thoroughly understand the work, live the philosophy, and teach it to others
	10 - Develop exceptional people and teams who follow your company’s philosophy
	11 - Respect your extended network of partners and suppliers by challenging them and helping them improve
4 - Continuously solving root problems drives organizational learning	12 - Go and see for yourself to thoroughly understand the situation
	13 - Make decisions slowly by consensus, thoroughly considering all options; implement decisions rapidly
	14 - Become a learning organization through relentless reflection and continuous improvement

2.2.3 Enablers *vs* inhibitors

Lean implementation has been theme of many research papers, however the method to effectively achieve this implementation is not straightforward. The main reason is due to the factors that act as enablers and/or inhibitors attending to the context, i.e. they are context-dependent (Amaro et al., 2020). In this paper, the authors performed a research to identify the existence of triggers that can transform an inhibitor into an enabler, and vice-versa, within the same context. During this research it was found a lot of ways to define what can affect/influence positively or negatively a Lean implementation journey that were called, in general, factors. So, it was important, first of all, to define what are “enablers” and “inhibitors” and to look for different words with the same meaning. If these words were considered in the keywords used, much more papers would appear in the search. The most frequent words found were: i) Enablers; ii) Inhibitors; iii) Barriers; iv) Drivers; v) Determinants; vi) Challenges; vii) Critical success factors (CSF) and viii) Key success factors. The Table 7 contains the definitions of some factors that are words with similar meaning found in the papers collected. Such definitions were extracted from the Oxford Dictionary.

This research resulted on the analysis of 16 papers, and the key sentences associated with the categories defined were collected in an Excel file.

Table 7 - Definitions of factors

Factor	Definition
Enabler	A person or thing that makes something possible
Inhibitor	A thing which inhibits someone or something
Barrier	A circumstance or obstacle that keeps people or things apart or prevents communication or progress
Driver	A factor which causes a particular phenomenon to happen or develop
Determinant	A factor which decisively affects the nature or outcome of something
Challenge	A call to prove or justify something
Key success factor	The factor that enables the accomplishment of an aim or purpose

The Figure 10 shows a word cloud from 141 sentences collected from the papers. In 44 of these 141 sentences, the authors found words related to enablers (E) and in 97 sentences were identified words related to inhibitors (I). For example, in the sentence “Involving employees as much as possible in the planning, implementation and evaluation of changes” (Sohal, 1996), the words “involving employees” are related with enablers. In the sentence “lack of management support and commitment” (Wyrwicka & Mrugalska, 2017), meaning that without support and commitment the lean implementation will be inhibited.

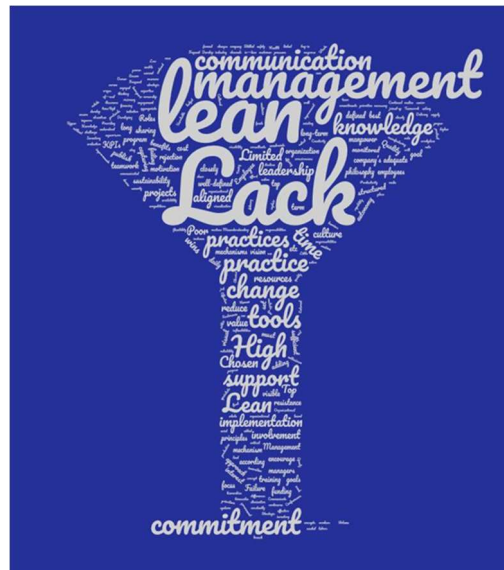


Figure 10 - A word cloud from the phrases identified

Based on the scrutiny of each sentence, common words were identified, and repetitive words were removed. From this scrutiny resulted 50 most frequent words, of which 25 were enablers and 25 inhibitors, presented in Table 8. The revision made to the 16 papers results in the main factors considered enablers and inhibitors and are summarized in the Table 8.

Table 8 - Identification of main enablers and inhibitors identified in the phrases
(adapted from Amaro et al., 2020)

Enablers (E)	Inhibitors (I)
<ol style="list-style-type: none"> 1. Need to change; 2. Commitment; 3. Top management support; 4. Adequate layout (e.g. cellular production); 5. Multi-Skilled workers; 6. Culture; 7. Time and space for Continuous Process Improvement; 8. Lean long-term goals; 9. Communicate lean wins; 10. Continuous evaluation during lean effort; 11. Increase market share; 12. Increase flexibility; 13. Development of key performance indicators; 14. Commitment to and wish for improvement; 15. Active leadership; 16. Participate personally; 17. Training to all levels (education and training); 18. Integrate lean in everyday business; 19. Use rewards and recognition; 20. Invest time and money; 21. <u>Use external "experts";</u> 22. Employees and staff involvement; 23. <u>Adequate resources to support change;</u> 24. Communication; 25. <u>Skills and expertise.</u> 	<ol style="list-style-type: none"> 1. Redundancy programme (i.e. downsizing); 2. Lack of top management commitment and support; 3. Lack of education and training; 4. Inadequate layout (prevent cells formation) 5. Changing economic conditions; 6. High levels of demand uncertainty; 7. Rigid organizational structure; 8. Resistance from workers and others; 9. Cultural barriers; 10. Backsliding to the old ways of working; 11. <u>Lack of know-how</u> and time; 12. Leaders example; 13. Financial benefits not recognized; 14. Inability/difficulty to quantify benefits; 15. The influence of trade unions; 16. Training cost; 17. Implementation time; 18. Fear of job cutting; 19. Distractions/slowdowns due to firefighting on other project/problems; 20. Lean not a daily focus; 21. Lack of involvement/motivation; 22. <u>Unqualified "expert";</u> 23. No plan; 24. <u>Insufficient resources;</u> 25. Plant size.

The factors that appear on both sides (E) and (I), are: i) Management support, ii) Culture, iii) Involving employees, iv) Training and v) Commitment. The definitions of these are in Table 9.

Table 9 - Definitions according to some authors and dictionaries

Factor	Definition
Management support	Allow workers to develop and use their skills and abilities (https://pmhut.com/management-support-is-important-to-employees)
Culture	The customs and beliefs, art, way of life and social organization of a particular country or group (Oxford, 2018)
Involving employees	Refers to the direct interaction between management and employees that encourages workers to take ownership of the outcome of a project. (https://smallbusiness.chron.com/difference-between-employee-participation-employee-involvement-13013.html)
Training	The process of learning the skills that need to do a job (Oxford, 2018)
Commitment	A promise to do something or to behave in a particular way; a promise to support somebody/something (Oxford, 2018)

Although some of these definitions seems similar, their interpretations may differ from authors, namely, involvement and commitment. Commitment is stronger than involvement as a committed person is willing to take risks.

Companies have “cultural monuments” that are built on three or four thinking’s within a company, often in fight with Lean Thinking. These “monuments” entail old strategies and rules that were once practical, but most members of the organization avoid from even inquiring about the status quo, although at first glance there are clear signs that current strategies are deteriorating (Murman, 2002). Dismantling these non-physical “monuments” is essential to achieve a Lean Culture.

Additionally, there are a lot of myths that need to be demystified for companies to accept Lean as a culture, namely, some authors have been discussing these myths as well the need to disambiguate them (Saurin et al., 2020; Schonberger, 2019). In particular, Browning and Treville (2021) dedicated a forum in the context of the Journal of Operations Management to discuss these topics, inviting famous researchers and practitioners of different fields (Cusumano et al., 2021; Hopp & Spearman, 2021).

The success of the lean system is mainly dependent on actions taken, principles implemented, and organizational change, rather than on lean tool adoption. The dominant cause of unsuccessful implementation of lean is failure to transform the organizational culture (Van der Merwe et al., 2014). Having enablers, the Organizational Culture of each organization could be transformed in a Lean Culture, detailed next.

2.2.4 Lean Culture

From the shop-floor, Lean Thinking emerged as an Organizational Culture (Amaro et al., 2020) that have been named Lean Culture by some authors (Al-Najem, Mohamad; Dhakal, Hom; Bennett, 2012; Dorval et al., 2019; Paro & Gerolamo, 2017; Taherimashhadi & Ribas, 2018; Zhao et al., 2019). Nevertheless, many other authors have been considered Lean as an Organizational Culture, even without entitled it, as reviewed by Amaro et al. (2021). These authors reviewed 84 papers that discussed Lean and

Organizational Culture and synthesized the main elements that characterized an organizational culture in those papers.

In a Lean Culture environment, people act naturally to identify and implement proposals to reduce waste. The explanation of a Lean Culture can be different from organization to organization, and it is reliant on upon how each organization define Lean. For instance, for Al-Najem et al. (2012) a Lean Culture involves shifting the mindset to make customers the uppermost importance.

Emiliani (1998) says that behaviors practiced over decades have resulted in robust organizational cultures and if companies align these behaviors to the organizational profile desired companies will achieve the transformation desired.

When an organization became a Lean organization, it will be concerned with their external partners, the suppliers, and it will help them to become lean as well. Some authors called this Lean Extended Enterprise (Burton Terence; Steven Beoder, 2003; Powell & Skjelstad, 2012; Schonberger, 2005) or just Lean Enterprise (Womack & Jones, 1994).

Lean Culture enable organizations to consistently attain: more innovation, team-directed solutions, lower employee turnover, better success at sustaining improvements, high numbers of improvement actions, better operational, economic and environmental performance (Ahmad, 2013; Amaro et al., 2019; Hardcopf et al., 2021).

2.3 Critical analysis

Managers need to decide on how to place their companies for the long run. At the same time, they must handle with competition, sustainability, and daily challenges. Such decisions must move from internal threats (e.g., silo-functional structure, miscommunication) and transform them in strengths, being proactive, to achieve external advantages, to put the organization answering to the market globalized needs. Normally, they do this in the work organizational model (sometimes a mixed model) they have that is supported by the Organizational Culture existent. However, knowing that there are different cultures and/or work organizational models, it could be a strategy of the organization to seek for a different work organizational that fits better what they want to achieve. When they want to change, they, most of the times, search help in consultant services.

Lean production became a work organizational model wanted by organizations (Amaro et al., 2019; Sinha & Matharu, 2019). Nevertheless, this demands a culture change (Amaro et al., 2021) and achieving this is not an easy task. The literature has been pointing out that most companies implementing Lean

programmes (either in public and private sectors) fail in achieving their goals (Bortolotti et al., 2015; Gary Cowger, 2016; Grigg et al., 2020; Lean Frontiers, 2017; Liker & Rother, 2010; Pakdil & Leonard, 2017; Pay, 2008; Sangwa & Sangwan, 2018). Several causes of this lack of success were identified (Akhtar et al., 2021; Araújo et al., 2021; Bortolotti et al., 2015; Lodgaard, 2016; Näslund, 2008; Pakdil & Leonard, 2017; Sangwa & Sangwan, 2018; Schonberger, 2018; Secchi & Camuffo, 2019).

This occurs due to barriers, already mentioned in section 1.1, as referred by many authors (Boscari et al., 2018; Gary Cowger, 2016; Grigg et al., 2020; Hines et al., 2018; Leme et al., 2016; Liker & Morgan, 2006; Pakdil & Leonard, 2017; Sangwan et al., 2003; Schonberger, 2019; Shrimali & Soni, 2017). From the literature review, the author of this thesis concluded that the main enablers/inhibitors are: i) Management support, ii) Culture, iii) Involving employees, iv) Training and v) Commitment (Amaro et al., 2020a). Nevertheless, these factors could be found in different organizations and did not just in the Portuguese organizations.

In particular, the Organizational Culture concept is very hard to identify because it is intrinsic to the company and is often a mix of cultures. Additionally, Organizational Culture could be a facilitator or inhibitor, depending on the company organizational culture, as reviewed by Amaro et al. (2020a). The literature review revealed that the answer to the first research sub-question *sRQ1.1: Is the Organizational Culture an enabler or inhibitor in this integration?* is true.

When an organization wants to transform the Organizational Culture also needs to transform the inhibitors in enablers. For this, it demands a deep knowledge of the Lean principles and a model to support this transformation. Although many models exist, as reviewed recently by Jasti et al. (2020), any model designed for Lean implementation must be supported by this knowledge and the Organizational Cultures type predominant in the organization (Amaro et al., 2021; Paro & Gerolamo, 2017). Being successful on this and having a suitable mode, it could be possible to embrace a Lean Culture (Al-Najem, Mohamad; Dhakal, Hom; Bennett, 2012; Taherimashhadi & Ribas, 2018). According to Al-Najem et al. (2012) to be cultural, Lean must be categorized as an Organizational Culture in which the values and behaviors are allied with the guiding principles of Lean Thinking.

Nevertheless, it was also demonstrated that Lean Thinking is successful in certain companies (Amaro et al., 2019; Barclay et al., 2021; Hines et al., 2004; Knol et al., 2018; Liker, 2007; Liker, 2004). In fact, a Lean implementation journey, even if temporarily successful, does not mean that the change will prevail in the long term. For sustaining Lean implementation, it is necessary that it became natural behaviors to learn, to improve, to adapt, to innovate, to looking for new challenges to be always open mind and do not

blame the others. This thesis proponent developed a model with characteristics discussed in this critical review. More details will be given in the chapter 5.

3. RESEARCH METHODOLOGY, STRATEGIES AND METHODS

This chapter presents a complete overview of the research methodology selected, the strategies and the methods selected to develop this study: a questionnaire and a case study.

3.1 Research methodology selection

For this thesis development, it was selected a research methodology suitable to the research that was undertaken. Before to discuss the research, methodology is important to review the different layers of research. This is presented having as a basis the diagram of research onion of Saunders et al. (2019) in Figure 11.

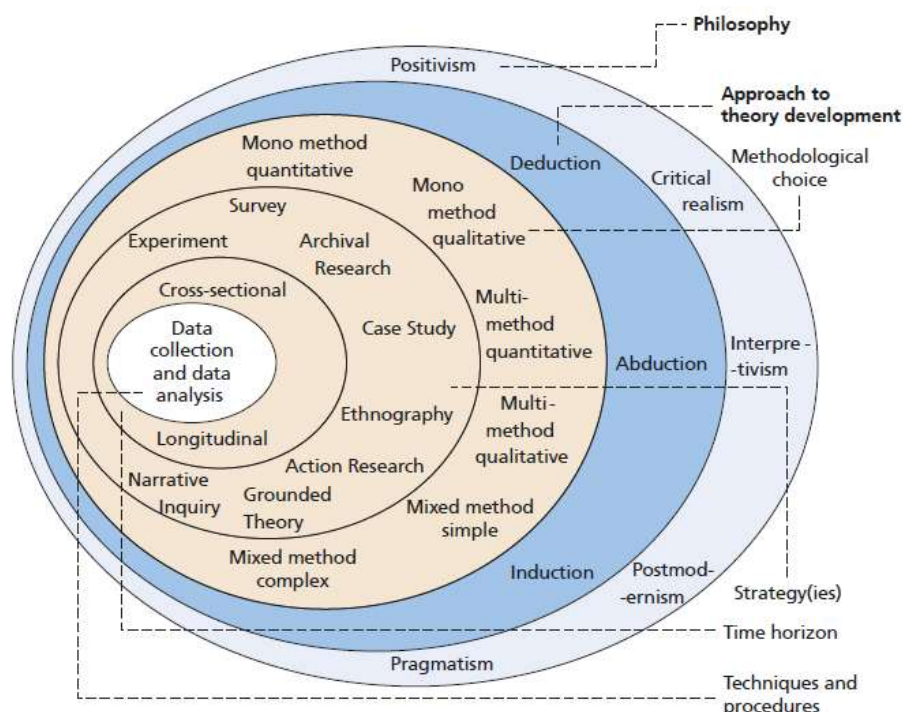


Figure 11 - The research onion
(Saunders et al. 2019b)

This diagram is organized in six layers that are the philosophy, approach to theory development, methodologic choice, strategy (ies), time horizon and techniques and procedures.

The first layer of the onion diagram is the research philosophy that refers to a system of beliefs and assumptions about the development of knowledge.

The philosophy used for this research was the Pragmatism because Pragmatism “*strives to reconcile both objectivism and subjectivism, facts and values, accurate and rigorous knowledge and different contextualized experiences. It does this by considering theories, concepts, ideas, hypotheses, and research findings not in an abstract form, but in terms of the roles they play as instruments of thought*”

and action, and in terms of their practical consequences in specific contexts. Reality matters to pragmatists as practical effects of ideas, and knowledge is valued for enabling actions to be carried out successfully" (Saunders, M., Lewis, P., & Thornhill, 2019).

According to Kelemen and Rumens (2008) pragmatists recognize that there are many ways of interpreting the world and undertaking research. For that, they use method or methods that enable credible, well-founded, reliable, and relevant data to be collected that advance the research.

The second layer of the onion diagram represent the approaches to theory development where the design of the research project distinguishes the extent to which the research is concerned with theory testing or theory building. The approach to the theory development used was a deductive approach as the thesis author research the literature to analysis the most pertinent and significant publications. The relations between the published references was explored and a conceptual model was developed based on this and on the experience of the thesis author.

The next layer, the third, of the onion is the methodological choice. The goal here is to choose the more adequate methodological for the research design. The methodological choice was the mixed methods research, because both methodologies were used. For the quantitative it was a questionnaire and as data analysis procedure were used some graphs (Saunders, M., Lewis, P., & Thornhill, 2019). For the qualitative, it was used the content analysis of the publications reviewed including words categorization for some research.

The fourth layer is the research strategy. A research strategy may therefore be defined as a plan of how a researcher will go about answering his research question. The research strategy used was the case study (described in 3.2.2), because a case study is an exhaustive inquiry into a topic or phenomenon within its real-life situation (Yin, 2018). The instance in case study research may mention to a person (e.g. a manager), a group (e.g. a work team), an organization (e.g. a business), an association (e.g. a joint venture), a change process (e.g. restructuring a company), an event (e.g. an annual general meeting) as well as many other kinds of case theme (Saunders, M., Lewis, P., & Thornhill, 2019).

The fifth layer is the time horizon. The goal is to design the research in a "snapshot" taken at a particular time or it to be more akin to a diary or a series of snapshots and be a representation of events over a given period. The time horizon chosen was the cross-sectional studies, because involves the study of a particular phenomenon (or phenomena) at a particular time (Saunders, M., Lewis, P., & Thornhill, 2019).

The sixth layer is data collection and data analysis. The data collection techniques used included observation, direct participation, document analysis, discussion with stakeholders and a questionnaire

that is described in section 3.2.1. Based on the questionnaire results and on what was reported in the literature review on models to implement Lean and on Organizational Culture, a model was developed. In chapter 5, this model that exploits synergies of Lean and Organizational Culture is described in detail. Then, the model was implemented and validated in a case study (described in chapter 6). The case study allowed the gathering of results to endorse the reliability of the model developed. The organization support and collaboration were essential to provide all the necessary information and data for a proper work development.

3.2 Research strategy and data collection selection

This section describes the main research instruments selected for this study: a questionnaire and a case study. The questionnaire was conducted to five organizations to assess their openness to implement the Lean Thinking principles and to identify the predominant type of culture on the organization. The case study was used to validate the model that will be presented in chapter 5.

3.2.1 Questionnaire purpose, structure and application

To attend the sub-question sRQ1.2 raised in the section 1.3 of this thesis: *“Is it more difficult this integration in the departments farthest of operations?”* it was developed a questionnaire to be applied in organizations. It was important for the research to select organizations that are working in different business sectors, namely, industry and in services.

Based on the existent contacts and the knowledge of the proponent of this thesis in recognizing on some organizations the willingness to apply Lean or interest on it, five organizations of the north of Portugal were selected, presented in the section 3.2.1.2.

Therefore, this section presents the questionnaire developed to collect data on the Organizational Culture status in five organizations, its purpose and structure. The purpose is to recognize the openness to Lean and the culture type in these companies. Thus, the questionnaire should be capable to identify the openness to integrate the Lean Thinking Principles on the Organizational Culture and, at the same time, to identify the predominant culture of each organization. To achieve this, the proponent of this thesis decided to build a questionnaire that should include three main parts in terms of structure.

Based on the culture models literature review, the author reviewed two models that have been used to diagnose the culture of a Lean organization. Such models were the Denison model and Cameron and Quinn model, reviewed in sections 2.1.1.2 and 2.1.1.3, respectively.

For instance, Al-Najem et al. (2012) created the Lean Culture Assessment Model (LCAM) relating the four dimensions of the Denison model with Lean Thinking principles. According to them, the four dimensions (mission, involvement, consistency and adaptability) have a great effect on the core organizational culture and help companies to face their basic underlying assumption and to know how far they are from to implement the Lean Thinking principles on the Organizational Culture (Al-Najem, Mohamad; Dhakal, Hom; Bennett, 2012). A closer look to the culture, and quantifying it, will allow to know if the culture is healthy enough to handle with Lean by knowing their weaknesses and strengths. The four dimensions mentioned early have predictors that would allow organizations to know their attitudes towards Lean.

Each trait of the four dimensions play an important role on the orientation on the focus for the Lean Thinking Principles to become integrated in the Organizational Culture. The first Lean Thinking Principle is “Define the Value” and this value is focused on satisfying the external customer and all stakeholders of the company. The Mission traits guides the employees to have a clear Strategic Direction & Intent, where a multi-year strategies are defined so that priorities are established to make the vision come true. The Goals & Objectives are defined, creating short-term specific goals, that help employees see how their daily activities are connected to the vision and the strategy. The Vision shows ultimate reason of business purpose. The second Lean Thinking Principle is the “Value Stream”, to deliver the value defined all steps must be defined and the respective process.

The third Lean Thinking Principle is the “Flow”, where all steps of the value stream must flow. The fourth Lean Thinking Principle is the “Pull”, where each step began only when is necessary to achieve needs of internal customer or external customer.

The fifth Lean Thinking Principle is the “Perfection”, where there is a continuous effort to improve the last four Lean Thinking Principles described. To support the full application of these Lean Thinking Principles the other traits of the dimensions Involvement, Consistency and Adaptability act as a lever, because involvement promotes empowerment, team orientation and capability development. Consistency drives to core values, agreement and coordination & integration. Adaptability pushes creating change, customer focus and organizational learning.

This revealed that the Denison Model is suitable to evaluate the openness to implement the Lean Thinking Principles on the Organizational Culture. The Denison model also emphasizes the strong link between culture and performance (Denison & Neale, 1999).

To indicate the dominant profile or culture type of a Lean organization, Paro and Gerolamo (2017) used the model of Cameron and Quinn to understand the most adequate profile to achieve long-term success and sustainability in lean growth and application.

By doing questionnaires in this research, it was intended to:

- Identify the openness to implement Lean;
- Identify the predominant type of organizational culture.

This identification allowed to measure the openness to the integration of the Lean Thinking Principles on the Organizational Culture and to recognize the predominant type of Organizational Culture in the organizations selected.

3.2.1.1 Structure

The questionnaire was entitled “Bi-dimensional Instrument for Lean Culture Openness (BDILCO)”. The beginning of the questionnaire (first page) describes its focus, guaranteeing respondents anonymity and answers confidentiality. With anonymity, respondents are more impelling to give unbiased answers (Saunders, M., Lewis, P., & Thornhill, 2019). The questionnaire was organized into three parts to facilitate its reading and, consequently, its completion. It has a total of 96 questions, as shown in Table 10.

Table 10 - Parts of the Organizational Culture questionnaire

Part	Title	No. of questions
1	Characterization of the respondent and the company	12
2	Denison Model	60
3	Cameron & Quinn Model	24

Next, the three parts are described:

- Part 1: was divided into two main sections: i) respondent characterization (age, education level, role, organization level, years in the organization and years in office); ii) identification and characterization of the organization (main activity sector, the main product(s)/service(s) provided, main market, company size, annual turnover, number of employees) (Table 38, Appendix 1);
- Part 2: dedicated to survey the organizational culture in relation to four dimensions adapted from Denison and Neale (1999). The dimensions surveyed were: i) Involvement; ii) Consistency; iii) Adaptability and iv) Mission. The aim was to know openness of the Organizational Culture to the Lean implementation (Figure 67, Appendix 1);
- Part 3: dedicated to survey the organizational culture in relation to six assessment items adapted from Cameron and Quinn (2011). These items are: i) dominant characteristics; ii) organizational leadership; iii) management of people and employee; iv) organizational glue; v) strategic

emphasis and vi) criteria for success. The aim was to define the dominant profile of a particular type of Organizational Culture (Adhocracy, Market, Hierarchy and Clan Culture) and if the result of this organizational culture profile is related to a Lean culture (Figure 68, Appendix 1).

The full questionnaire can be found in Appendix 1, with the handouts of the slides presented to the interviewees.

3.2.1.2 Sample selection

The questionnaire was applied to organizations from industry and services. The organizations analyzed were implanted in Portugal and are from manufacturing, service, and public service. Table 11 shows the characterization of the organizations: type of business and activity sector, main markets and the dimension related to the number of employees. The organizations selected are very different from each other. Organization 1, 3 and 5 are Portuguese organizations that became multinational. The case study 4 is a public administration organization of one of the most important cities of Portugal.

Table 11 - Organization's characterization

Case study #	1	2	3	4	5
Business sector	Industry & Services	Industry	Services	Services	Services
Activity sector	Energy	Automotive components	Retail, Industry, Telecommunications, Tourism	Public administration	Renewables
Main markets	Portugal, Europe and America	Europe, America and others	Portugal, Spain	Portugal	Europe and South America
Multinational	Yes	Yes	Yes	No	Yes
Employees' nr.	>1000	>1000	>10000	>1000	> 100

Except for case study 1, questionnaires were applied to one business area or corporate area of the organization selected to collect results from areas that are production-related and services-related (departments farthest of operations) and answer to the sub-question sRQ1.2. On case study 1, the questionnaire was applied on two business areas of the organization and on three corporate areas. The organizations pertained to various activity sector, such as: manufacturing; wholesale and retail trade; automotive; energy; public service; renewables. Three of these organizations belong to a large group, constituted by several Business Units supported by Corporate Units.

3.2.1.3 Questionnaire application

Due to the pandemic condition experienced during this research, the questionnaire was applied to 26 professionals from different business areas of the selected organizations, through a personal one-hour videoconference session in the following period:

- Case study 1: between August 2020 and December 2020;

- Case study 2: September 2020;
- Case study 3: October 2020;
- Case study 4: November 2020;
- Case study 5: January and February 2021.

Based on the results it was possible to have an overview of the level of awareness on the integration of Lean Thinking on Organizational Culture, as presented in chapter 4. These results served as inputs to the model development, which was developed attending to the need of having flexibility for the organizations to integrate Lean Thinking principles in their Organizational Culture.

3.2.2 Case study research

Another research instrument used in this research project was the case study. Defined by Yin (1984, p. 23) as: "... an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used". The case study approach is frequently used in exploratory and explanatory research. There are many data gathering techniques that can be used and, even used in combination, such as, interviews, observation, documentary analysis and questionnaires (Saunders, M., Lewis, P., & Thornhill, 2019). Based on two diverse levels, Yin (2018) distinguishes four case study strategies:

- Single case vs multiple case;
- Holistic case vs embedded case.

A single case is used to embody a critical case or, then, an extreme or exclusive case. A multiple case study strategy embraces more than one case and is justified by the need of confirming if the results of the first case occur in other cases, to take a broad view from these findings. The second-dimension relays to the unit of investigation. In a holistic case study, the research is worried with the organization. By opposition, in a surrounded case, the research is concerned with more than one unit of study within an organization, like departments or work groups, or whatever logical sub-units selected (Yin, 2018).

Based on the analysis of the surveys and research on existing methodologies to implement Lean Thinking and identify the type of Organizational Culture, the proposed model was developed. Then, the model was validated using a case study strategy. The author purpose was to validate the model through its application in a real case, with the aim of evaluating its relevance and operation.

Based on case study meaning, it can be supposed that case study as a research method supports to understand, explore, or describe events, in which numerous factors are simultaneously intricate in a real context. For its application, Yin (2003) ponders that four stages are needed:

- 1) Design the case study,
- 2) Conduct the case study,
- 3) Analyze the evidence from the case study,
- 4) Develop conclusions, recommendations, and implications.

For this research work, the strategy of the case study began with the description of a protocol, to validate the developed model as designated in chapter 5. The protocol should contain the investigation tools and procedures as well as the guidelines to be followed. For this determination, in this research work, the guidelines from Yin (2003) that were followed are presented in Figure 12.

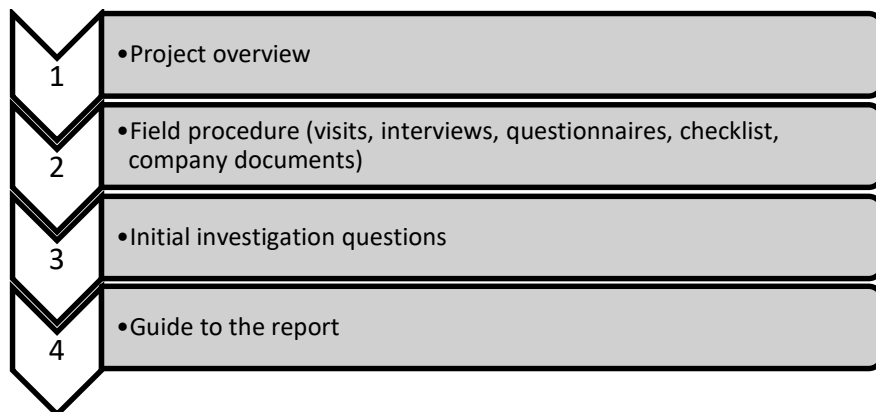


Figure 12 - Guidelines for the definition of the case study protocol
(adapted from Yin, 2003).

For the case study selection, the conditions were the interest and availability of the organization to participate in the study, its openness, and its support in data collection. Based on these selection criteria, one company was chosen, which will be designated as a case study throughout this thesis. The full characterization of the company selected can be found in chapter 6, as well as the implementation results of the model for its corroboration.

4. LEAN PRINCIPLES ON THE ORGANIZATIONAL CULTURE OF ORGANIZATIONS: SOME RESULTS

This chapter presents the results of the Bi-dimensional instrument for Lean Culture Openness (BDILCO) questionnaire. This questionnaire was applied in five organizations from different business areas, to a different number of interviewees characterized in the following section.

4.1 Interviewee's profile and characterization

This section presents the respondent's profile. To characterize the respondents, it was used a numerical code with four digits, as represented in Table 12.

Table 12 - Classification code for interviewees

Digit	First	Second	Third	Fourth
Meaning	Identifies the case study	Business Area (1 - Production, 2 - Service, 3 – Corporate)	Hierarchical level (1 – Director, 2 – Supervisor, 3 – Line Manager, 4 – Operator)	Interviewee

In Table 13 is presented the number of interviewees from the five case studies and their business areas described in section 3.2.1.2 Sample selection in total, it was conducted 24 interviewees.

Table 13 - Number of the interviewees and their business areas for each case study

Case study nr (interviewees nr)	Production	Service	Corporate				
			EHS	Procurement	Financial	Continuous Improvement	Budgeting
Case study 1 (14)	1.1.1.12; 1.1.2.13; 1.1.3.14	1.2.1.3; 1.2.2.4; 1.2.3.5	1.3.1.1; 1.3.3.2	1.3.1.6; 1.3.2.7; 1.3.3.8	1.3.1.9; 1.3.2.10; 1.3.4.11		
Case study 2 (3)	2.1.1.1; 2.1.2.2; 2.1.3.3						
Case study 3 (2)						3.3.1.1; 3.3.2.2	
Case study 4 (2)		4.2.1.1; 4.2.2.2					
Case study 5 (3)							5.3.1.1; 5.3.2.2; 5.3.4.3

Breakdown of the part 1 results (identification of the respondents' function) of the questionnaire show that the respondents' functions within organizations varied considerably, ranging from CEO, Executive/Senior Vice President, Senior management, Middle management, and Line management. The profile most represented was the Executive/Senior Vice President and Middle management (7), as can be seen in Figure 13. The goal was, in each area (organization) apply the questionnaire on three different levels of the organization.

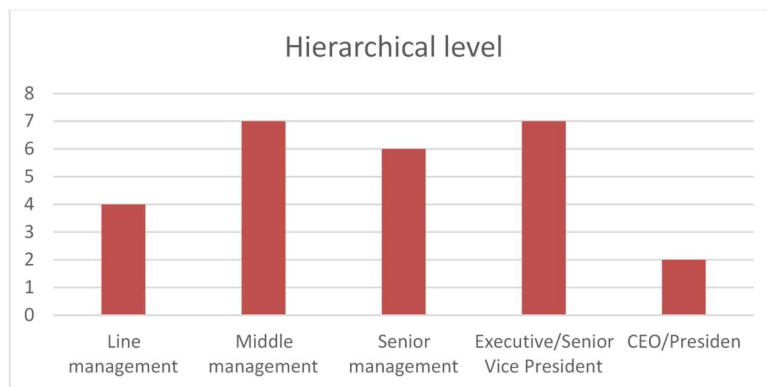


Figure 13 - Hierarchical level

Regarding service years in the organization, 23% of respondents have worked more than 15 years, 19% worked between 10 and 15 years and 58% were less than 10 years in the organization (Figure 14).



Figure 14 - Years in the organization

Regarding service years in function, about 80% of respondents have worked for less than 6 years, 14% worked between 6 and 10 years in the organization. The other 4% of the respondents worked between 4 and 6 years in the organization (Figure 15).

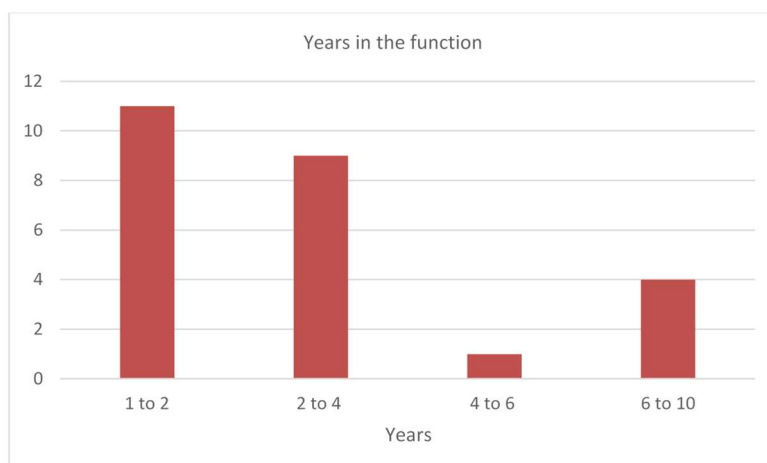


Figure 15 - Years in the function

The demographic categorization of the organizations was distributed by 4% of the respondents on the 20 – 29 age, 18% of the respondents on the 50 – 59 age, 32% of the respondents on the 30 – 39 age and 46% of the respondents on the 40 – 49 age (Figure 16).

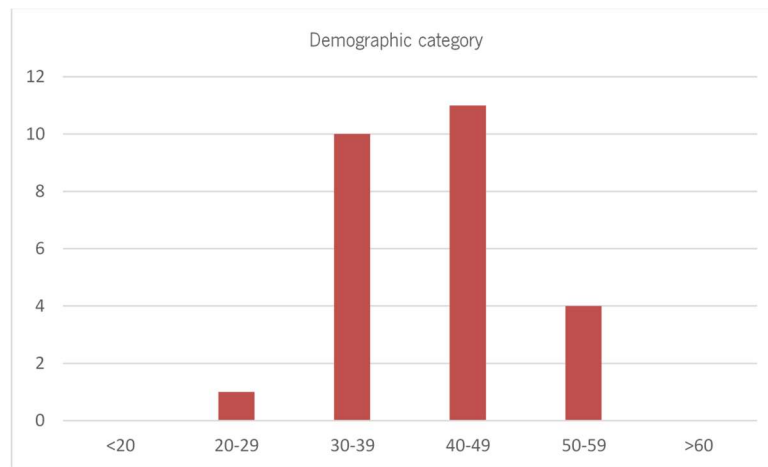


Figure 16 - Demographic category

The gender categorization of the organizations was distributed by 77% of the respondents Male and 23% of the respondents are Female (Figure 17).

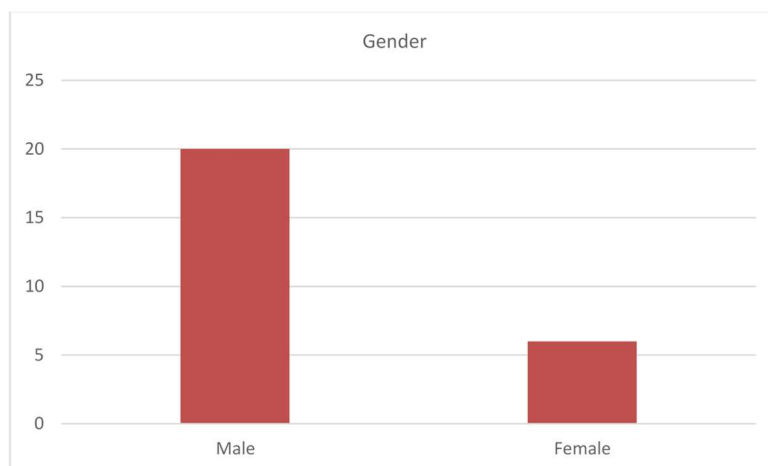


Figure 17 - Respondent's gender

All the interviewees were available and helpful. Most of them were very interested in knowing the results. Thus, the results were discussed with the respondents and the feedback was collected and included in the following section.

4.2 Openness to the Lean Thinking principles and type of Organizational Culture

This section presents the results concerning the investigation of the openness to implement the Lean Thinking Principles on Organizational Culture and what kind of Organizational Culture the organization had in the moment of the interview. Such results come from part 2 and part 3 of the Bi-dimensional instrument for Lean Culture openness (BDILCO) questionnaire.

4.2.1 Denison and Neale model: the openness to implement the Lean Thinking Principles

The goal of the part 2 of the questionnaire based on Denison model was to get data to analyze the openness of the organization to implement Lean Thinking Principles.

4.2.1.1 Case study 1 – Industry and Services

On case study 1, the questionnaire was applied on two Business Units and on three Corporate Units, in a total 14 respondents. The Figure 18 presents the results of three respondents of the Business Unit Production. Analyzing these results related to the Business Units of the case study 1, the Production mean scores were: on Mission dimension 85%, on Consistency dimension 72%, on Involvement dimension 69% and on Adaptability dimension 65%. The trait best evaluated was the Strategic Direction & Intent with 100% and the worst trait evaluated was Team Orientation with 20%.

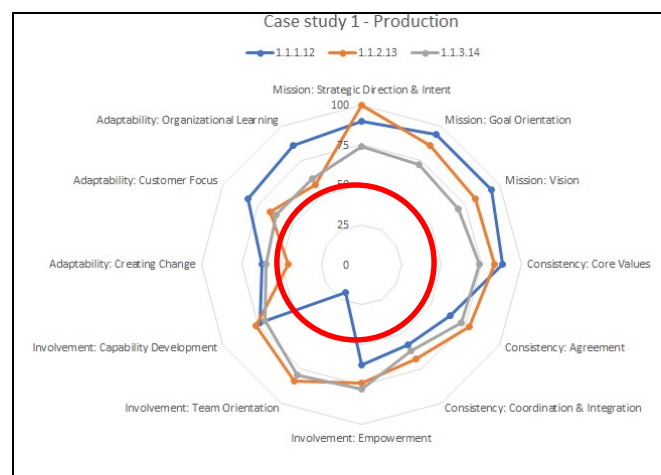


Figure 18 - Results of interviews on case study 1 - Business Unit Production

According to Denison and Neale (D. Denison & Neale, 1999), when the score of a trait/index is less than 50% (represented in the figure by the red circle), the company must pay attention, as this reveals a vulnerability. This indicates that people may be disengaged from their work, unconscious of their importance and link to the rest of the organization, reluctant to accept greater responsibility, or timid about working with people outside of their direct circle.

In this case study the respondents evaluated on dimension “Involvement”, the trait “Team Orientation” with 20% and “Employees’ involvement” is recognized as a successful factor in Lean implementations. This could indicate that if the company of case study 1 wants to implement Lean it needs to increase this involvement (Amaro et al., 2021). Also, one of the respondents evaluated on dimension Adaptability, the trait “Creating Change”, with 48%. “Creating Change” is correlated with the fifth Lean Thinking principle (continuous improvement) that is needed to support Lean implementation. In fact, company of this case study has been implementing some lean tools but without achieving its full potential.

The Figure 19 presents the results of three respondents of Business Unit Service of the same case study.

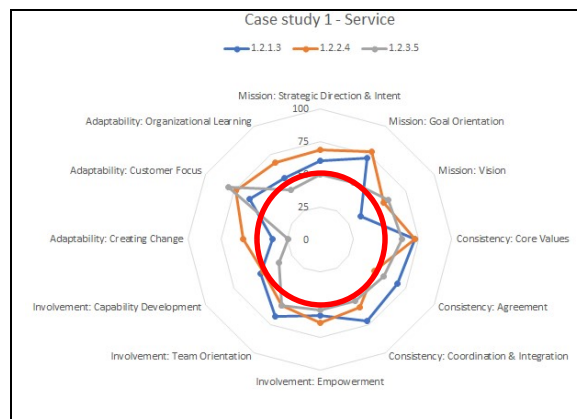


Figure 19 - Results of interviews on case study 1 - Business Unit Service

The Service mean scores were: on Mission dimension 59%, on Consistency dimension 63%, on Involvement dimension 55% and on Adaptability dimension 55%. The trait best evaluated was Goal Orientation with 78% and the worst trait evaluated was Creating Change with 24%. This low evaluation (24, 36, 58) on the trait Creating Change, shows that this organization is not able to deal properly with customer/market changes. On Mission dimension, the low evaluation (36, 56, 60) on the trait Vision means that the organization lacks a long-term planning and significant organizational culture change is necessary. The results of Service Unit (case study 1) show that have low acceptance to implement Lean.

Despite these two Business Units belong to the same company, the scores of each dimension of Production Business Unit are more quantified compared to Service Business Unit. One possible reason is that during the application of the questionnaires on the Service Business Unit, the PhD proponent, besides of questionnaire questions, asked if they know what Lean Thinking is, and the answers were “have heard about the topic”. The person that answered the questionnaire on Production Business Unit know what Lean Thinking is.

The Figure 20 presents the results of two respondents from the Corporate Unit EHS of the same case study.

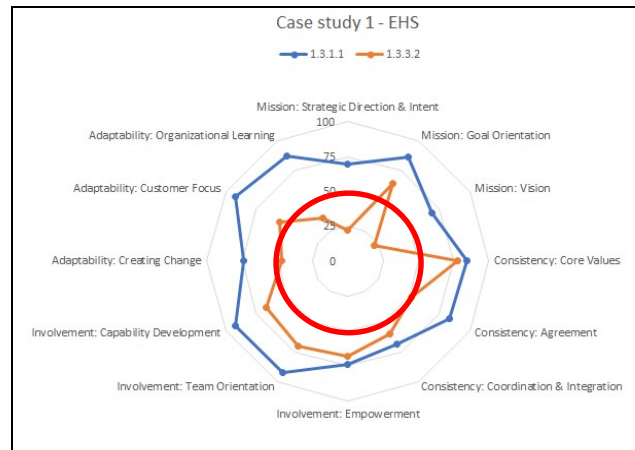


Figure 20 - Results of interviews on case study 1 - Corporate Unit 1

The results related to the Corporate Units of the case study 1, the EHS mean scores were: on Mission dimension 56%, on Consistency dimension 71%, on Involvement dimension 77% and on Adaptability dimension 65%. The trait best evaluated was the Team Orientation, Capability Development and Customer Focus with 100% and the worst trait evaluated was Strategic Direction & Intent with 22%. One of the respondents have almost all the Traits evaluated near the 75%. That is a person that have the conditions to apply Lean and during the interview demonstrate have some knowledge about lean. The other respondent has lower quantification in all Traits, highlighting adversely the Mission Dimension, on the Traits Strategic Direction & Intent and on the Trait Vision with the score of 22%. This scores reflects a need for this respondent to be better aligned with the basic points of each work that is Mission of the organization. He highlights adversely too the Adaptability Dimension on the Traits of Organizational Learning with the quantification of 36 % and on the Traits Creating Change with the score of 47%. These score revel a need to specify actions to improve the score of the Mission and Adaptability Dimensions of the respondent with low scores.

The Figure 21 presents the results of three respondents the Corporate Unit Financial of the case study 1.

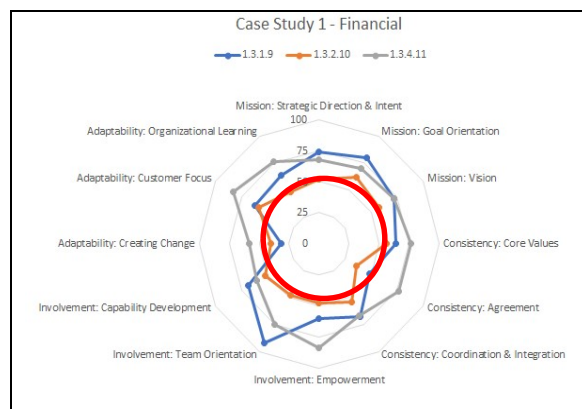


Figure 21 - Results of interviews on case study 1 - Corporate Unit 2

The Financial mean scores were: on Mission dimension 66%, on Consistency dimension 61%, on Involvement dimension 65% and on Adaptability dimension 58%. The trait best evaluated was Team Orientation with 92% and the worst trait evaluated was Creating Change with 32%. The results of this corporate area show that in the mean they have in general low scores in all Dimensions, more especially one of the respondents have almost of scores in all traits near or under the 50%. Like Denison and Neale (Denison & Neale, 1999) said that all the traits less than 50%, the organization must pay attention, and the respondent 1.3.2.10 quantify the traits Agreement with 36%, Empowerment with 48, Team Orientation with 48%, Creating Change with 40%, and Organizational Learning with 48%. This reveals that low involvement organizations usually have classic control hierarchies in which people are very dependent on their boss and very concerned about following the orders that come down the hierarchy. Low adaptability scores usually have an inward focus and have difficulty responding to customers, competitors, and employees with new ideas. Low adaptability organizations run on inertia, and their past achievements can create barriers for future success.

The Figure 22 presents the results of three respondents of the Procurement Business Unit of case study 1.

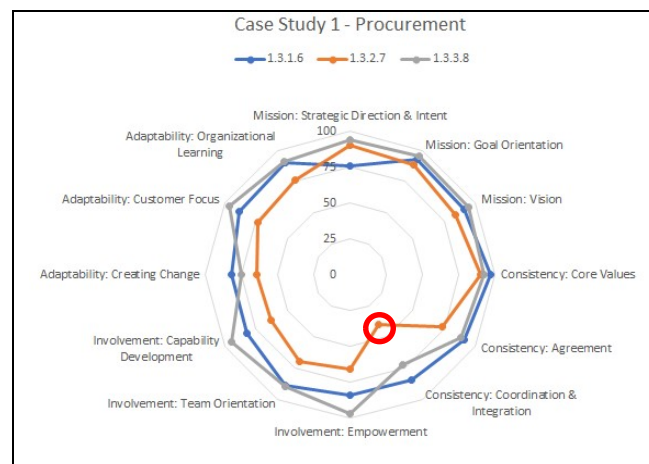


Figure 22 - Results of interviews on case study 1 - Corporate Unit 3

The Procurement Business Unit mean scores were: on Mission dimension 89%, on Consistency dimension 81%, on Involvement dimension 82% and on Adaptability dimension 82%. The trait best evaluated was Core Values and Empowerment with 97% and the worst trait evaluated was Coordination & Integration with 40%. In general, this Corporate Area have good scores in all traits, except the score of the respondent 1.3.2.7 on the trait Coordination & Integration. This low score may indicate that this respondent has a perception that the different functions and units of the organization are not able to work together well to achieve common goals.

The Corporate Units EHS and Financial follows a similar mean of scores of the Business Unit of Service. It is interesting to note that the Corporate Unit of Procurement had the highest scores in relation to all questionnaires made on case study 1. Even been a Corporate Unit the Procurement exceeded the scores of Production Unit, this shows that it is not important the type of area of the organization, what is important are the teams of each area that must be aligned with the Lean Thinking concepts and apply these concepts in their daily work.

4.2.1.2 Case study 2 – Industry

The Figure 23 presents the results of three respondents of the case study 2, Production Business Unit.

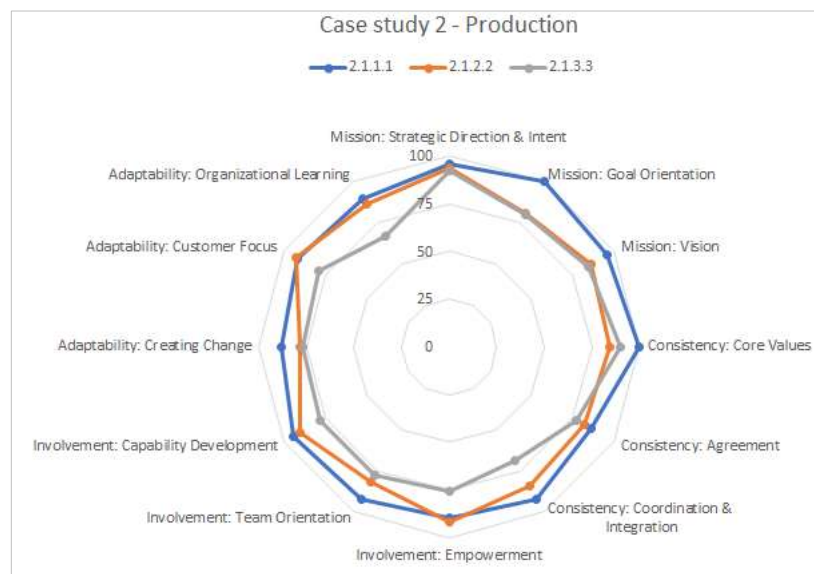


Figure 23 - Results of interviews on case study 2 - Production

Analyzing the results related to the Production Business Unit of the case study 2, the mean scores were: on Mission dimension 90%, on Consistency dimension 85%, on Involvement dimension 86% and on Adaptability dimension 84%. The trait best evaluated was the Goal Orientation and Core Values with 100% and the worst trait evaluated was Organizational Learning with 67%. This organization have all conditions to implement Lean. In fact, they already implemented it, and they are always looking forward to improving.

4.2.1.3 Case study 3 – Services

The Figure 24 presents the results of three respondents of case study 3 Continuous Improvement Corporate Unit.



Figure 24 - Results of interviews on case study 3 - Service

Analyzing the results related to the Continuous Improvement Corporate Unit of the case study 3, the mean scores were: on Mission dimension 97%, on Consistency dimension 89%, on Involvement dimension 85% and on Adaptability dimension 86%. The trait best evaluated was Strategic Direction & Intent with 100% and the worst trait evaluated was Agreement with 66%. This organization already implemented Lean and they have a Lean School to train their employees (Mota & Mesquita, 2022).

4.2.1.4 Case study 4 – Services in public administration

The Figure 25 presents the results of one respondent of case study 4, Services in public administration. Although, two respondents were interviewed, one of them did not answer to this part of the BDILCO.



Figure 25 - Results of interviews on case study 4 - Services in public administration

Analyzing the results related to the Services in public administration of the case study 4, the mean scores were: on Mission dimension 99%, on Consistency dimension 93%, on Involvement dimension 88% and on Adaptability dimension 90%. The trait best evaluated was Strategic Direction & Intent with 100% and

the worst trait evaluated was Empowerment with 83%. This organization already implemented Lean. They have the support of one external organization. Now they are spreading the Lean for other areas of this organization.

4.2.1.5 Case study 5 – Services

The Figure 26 presents the results of three respondents of case study 5, Budgeting Corporate Unit.

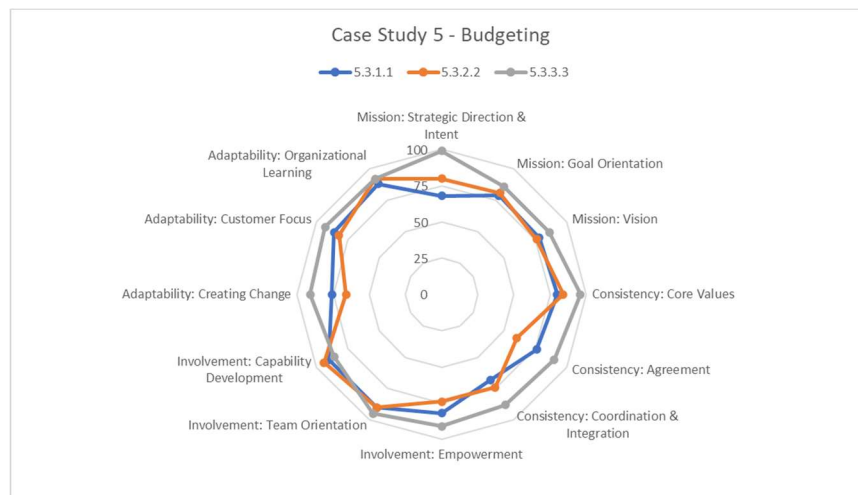


Figure 26 - Results of interviews on case study 5 - Budgeting

Analyzing the results related to the Corporate Unit Budgeting of the case study 5, the mean scores were: on Mission dimension 81%, on Consistency dimension 80%, on Involvement dimension 88% and on Adaptability dimension 85%. The trait best evaluated was Strategic Direction & Intent with 99% and the worst trait evaluated was Creating Change with 66%. This organization have good conditions to implement Lean. Currently, this organization has the Institute Kaizen working with them to help to improve the organization process. These results also show that this Corporate Unit of this organization, even not being from the production area has openness to implement Lean Thinking.

4.2.2 Competing Values Framework: Organizational Culture trend

From the literature review, the model selected to evaluate the type of Organizational Culture predominant was the Cameron and Quinn model (2006) that was the goal of the part 3 of the BDILCO questionnaire. Thus, it was collected data to analyze the predominant profile of the organization. This model uses a framework called Competing Values Framework (CVF). Responses on the six items: Organizational Characteristics, Organizational Leader, Management of Employees, Organizational Glue, Strategic Emphasis and Criteria of Success, help to highlight aspects of organization's culture that identify its dominant culture type.

4.2.2.1 Case study 1 – Industry and Services: OCAI results

The

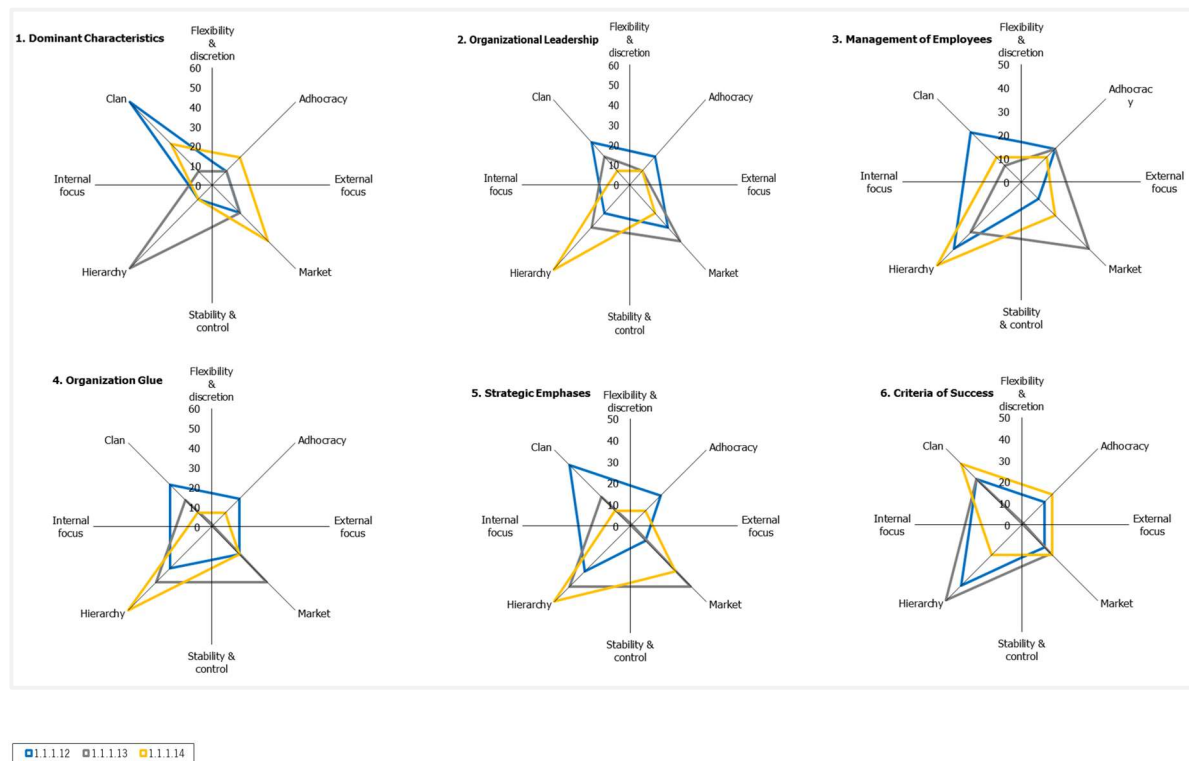


Figure 27 shows the profiles for Organizational Culture Assessment Instrument (OCAI) individual items related to Case study 1 – Production area.

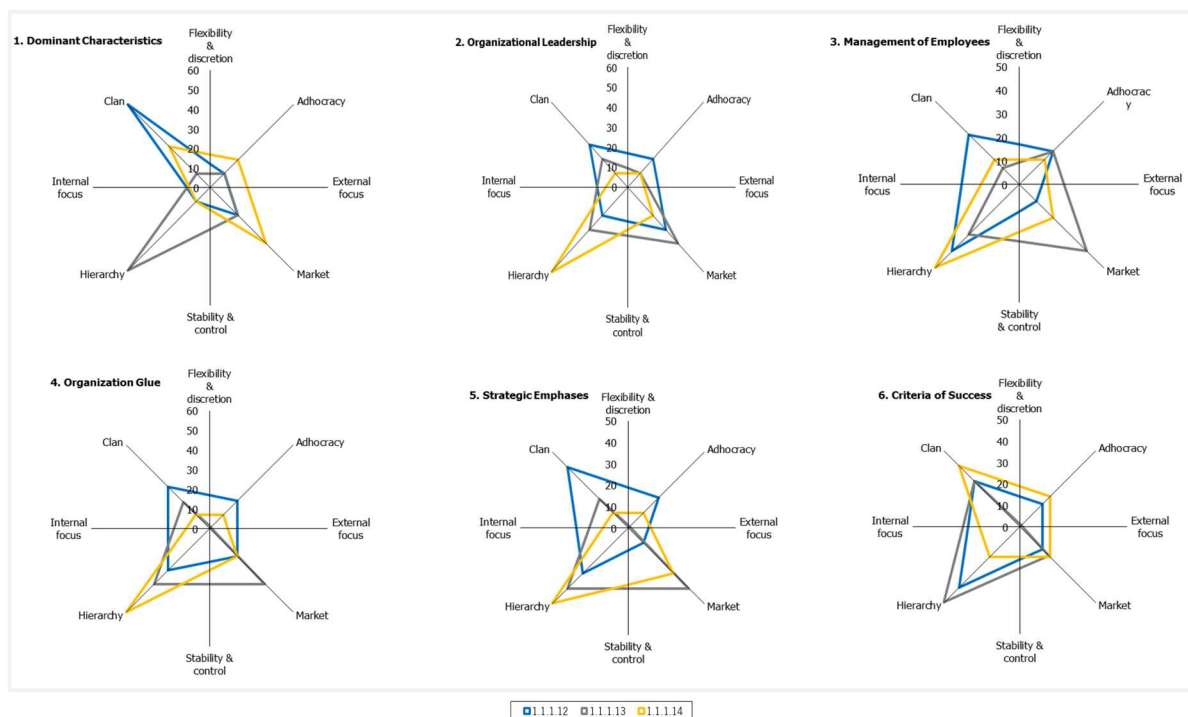


Figure 27 - Profiles for individual items related to case study 1 - Production area

For respondent 1.1.1.12 (blue color), the dominant culture type on the Dominant Characteristics profile is the Clan culture, with the score of 60%, on the Organizational Leadership profile is Market and Clan, with the score of 30%, on Management of Employees profile is Hierarchy, with the score of 40%, on Organizational Glue profile is Clan and Hierarchy with the same score of 30%, on Strategic Emphases profile is Clan, with the score of 40%, on Criteria of Success is Hierarchy, with the score of 40%. Results of the dominant culture of each profile for individual items are not congruent.

For respondent 1.1.1.13 (grey color), the dominant culture type on the Dominant Characteristics profile is the Hierarchy culture, with the score of 60%, on the Organizational Leadership profile is Market, with the score of 40%, on Management of Employees profile is Market, with the score of 40%, on Organizational Glue profile is Market and Hierarchy with the same score of 40%, on Strategic Emphases profile is Market and Hierarchy with the same score of 40%, on Criteria of Success is Hierarchy, with the score of 50%. Results of the dominant culture of each profile for individual items are not congruent.

For respondent 1.1.1.14 (yellow color), the dominant culture type on the Dominant Characteristics profile is the Market culture, with the score of 40%, on the Organizational Leadership profile is Hierarchy, with the score of 60%, on Management of Employees profile is Hierarchy, with the score of 50%, on Organizational Glue profile is Hierarchy with the score of 60%, on Strategic Emphases profile is Hierarchy with the score of 50%, on Criteria of Success is Clan, with the score of 40%. Results of the dominant culture of each profile for individual items are shows some congruence in spite of Hierarchy culture (four out of six are congruent).

The analysis of the results these three respondents of the same company shows that in both cases the profiles for individual items are not congruent. This means that each respondent acts differently.

Figure 28 shows the aggregated results of the individual items related to the cultural profile of the case study 1 – Production area.

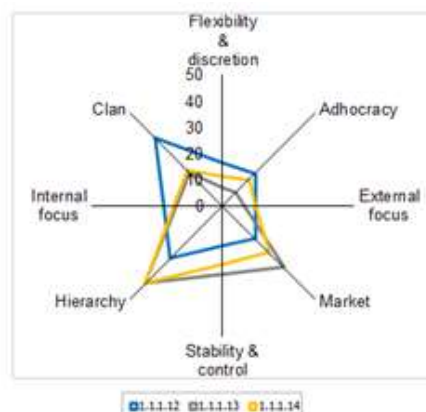


Figure 28 - Individual items combined profile of case study 1 - Production area

The dominant culture is the Hierarchy Culture (respondents 1.1.1.13 and 1.1.1.14), with a similar pattern. The dominant culture for respondent 1.1.1.12 is the Clan Culture. The Business Unit of case study 1 – Production, have different dominant cultures type (Clan and Hierarchical), which may contribute for different basic assumptions, styles, and values that predominate. In this case, the team has different directions, i.e., team members from different hierarchical levels are not aligned. This has a negative impact on the team performance and on the objectives to achieve. These differences can weaken the way the organization works and competes in the market.

The Figure 29 shows the profiles for OCAI individual items related to case study 1 – Service area.

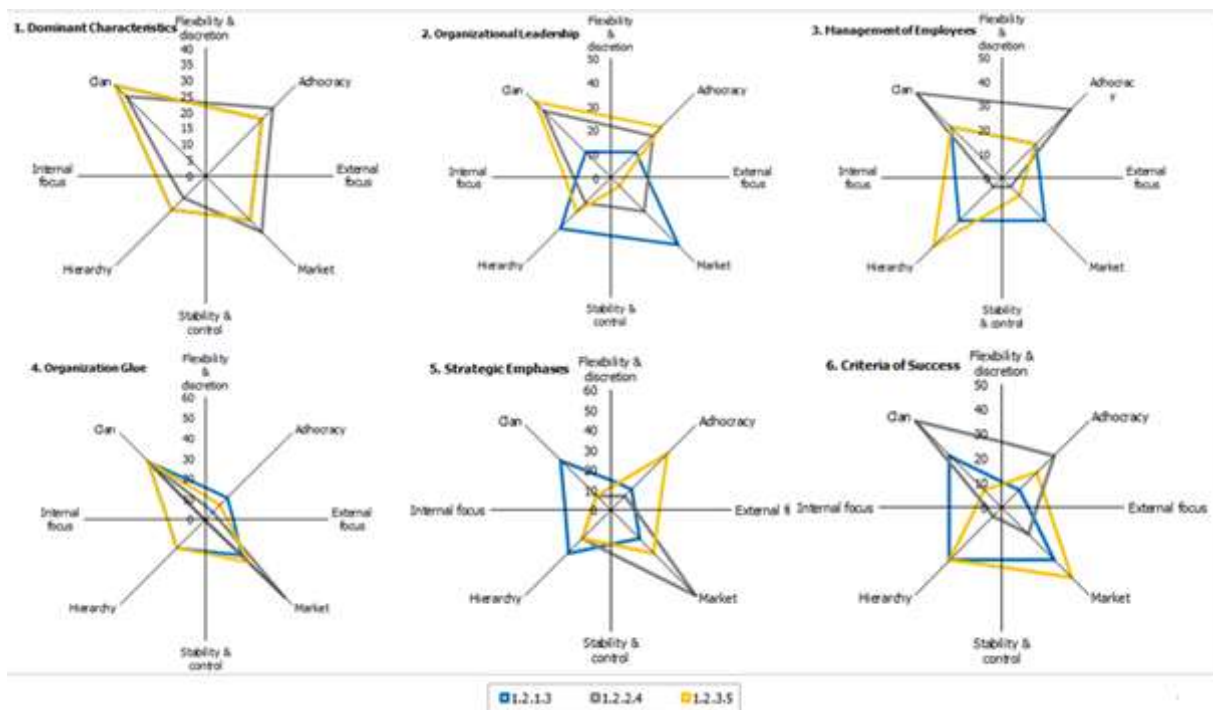


Figure 29 - Profiles for individual items related to case study 1 - Service area

For respondent 1.2.1.3 (blue color), the dominant culture type on the Dominant Characteristics profile is the Clan culture (it is important to notice that the blue color of this respondent is not visible in this dimension because it is equal to the answers of respondent 1.2.2.4: yellow color), with the score of 40%, on the Organizational Leadership profile is Market, with the score of 50%, on Management of Employees profile is Clan, with the score of 30%, on Organizational Glue profile is Clan with the same score of 40%, on Strategic Emphases profile is Clan, with the score of 35%, on Criteria of Success is Clan and Hierarchy, with the score of 30%. The results of the dominant culture of each profile for individual items are congruent (five out of six are congruent).

For respondent 1.2.2.4 (grey color), the dominant culture type on the Dominant Characteristics profile is the Clan culture, with the score of 35%, on the Organizational Leadership profile is Clan, with the score

of 45%, on Management of Employees profile is Clan, with the score of 50%, on Organizational Glue profile is Market and Hierarchy with the same score of 55%, on Strategic Emphases profile is Market with the score of 60%, on Criteria of Success is Clan, with the score of 50%. Results of the dominant culture of each profile for individual items shows some congruence (four out of six are congruent).

For respondent 1.2.3.5 (yellow color), the dominant culture type on the Dominant Characteristics profile is the Clan culture, with the score of 40%, on the Organizational Leadership profile is Clan, with the score of 40%, on Management of Employees profile is Hierarchy, with the score of 40%, on Organizational Glue profile is Clan with the score of 40%, on Strategic Emphases profile is Adhocracy with the score of 40%, on Criteria of Success is Market, with the score of 40%. Results of the dominant culture of each profile for individual items are not congruent.

The analysis of the results between these three respondents of the same company shows that in both cases the profiles for individual items are not congruent. Similar to the production area, the same respondents' answers pattern occurred.

The Figure 30 shows the aggregated results of the individual items related to the cultural profile of the case study 1 – Service area.

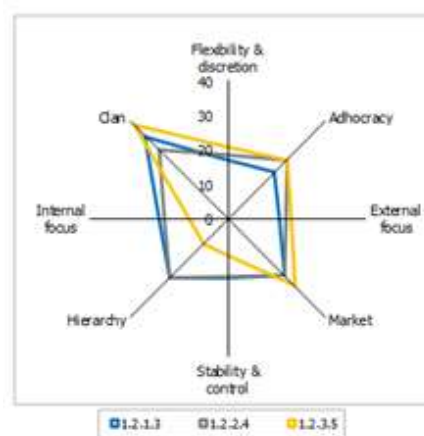


Figure 30 - Individual items combined profile of case study 1 - Service area

The dominant culture is the Clan Culture for all respondents. The Business Unit of case study 1 – Service area, have the same dominant culture type (Clan), with a similar pattern. However, this similarity does not mean respondents act in the same way, because the results of the individual profiles are not congruent. The Clan Culture is most effective in domains of performance related to morale, satisfaction, internal communication, and supportiveness, according to Cameron and Quinn (Cameron & Quinn, 2006).

The Figure 31 shows the profiles for OCAI individual items related to case study 1 – EHS area. For respondent 1.3.1.1 (blue color), the dominant culture type on the Dominant Characteristics profile is the Hierarchy culture, with the score of 40%, on the Organizational Leadership profile is Market, with the score of 40%, on Management of Employees profile is Hierarchy, with the score of 50%, on Organizational Glue profile is Hierarchy with the same score of 50%, on Strategic Emphases profile is Hierarchy, with the score of 50%, on Criteria of Success is Clan, Hierarchy and Market, with the score of 30%. The results of the dominant culture of each profile for individual items are congruent (five out of six are congruent).

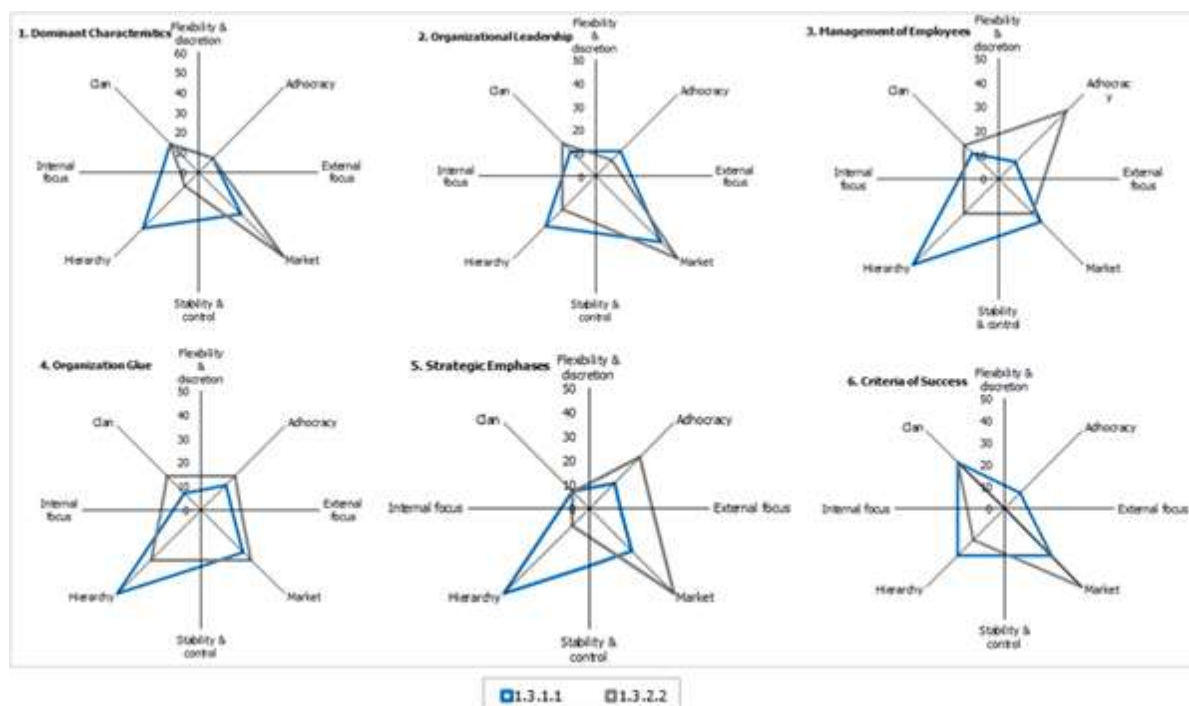


Figure 31 - Profiles for individual items related to Case study 1 - EHS area

For respondent 1.3.2.2 (grey color), the dominant culture type on the Dominant Characteristics profile is the Market culture, with the score of 60%, on the Organizational Leadership profile is Market, with the score of 50%, on Management of Employees profile is Adhocracy, with the score of 40%, on Organizational Glue profile is Market and Hierarchy with the same score of 40%, on Strategic Emphases profile is Market with the score of 50%, on Criteria of Success is Market, with the score of 50%. Results of the dominant culture of each profile for individual items are congruent (five out of six are congruent).

The analysis of the results of the two respondents of the same Corporate Unit shows that the profiles for individual items are not congruent that have implications as previously mentioned.

The Figure 32 shows the aggregated results of the individual items related to the cultural profile of the case study 1 – EHS area.

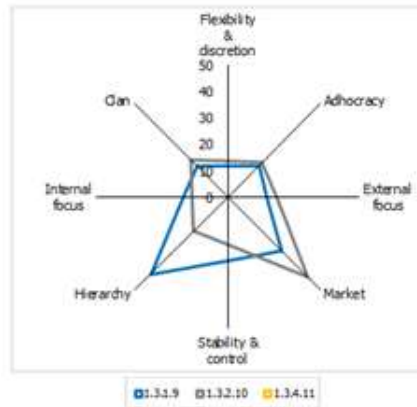


Figure 32 - Individual items combined profile of case study 1 - EHS area.

The dominant culture is the Hierarchy Culture for respondent 1.3.1.1 and Market Culture for respondent 1.3.2.2 respondents. The Corporate Unit of case study 1 – EHS have different dominant culture type (Hierarchy and Market). This means that in this Corporate Unit, the focus is not aligned, for respondent 1.3.1.1 translates an organization that focuses on internal maintenance with a need for stability and control. The respondent 1.3.2.2 translates an organization that focuses on external positioning with a need for stability and control. As a team they are misaligned. Again, the team has different directions, i.e., team members from different hierarchical levels are not aligned.

The Figure 33 shows the profiles for OCAI individual items related to case study 1 – Financial area.

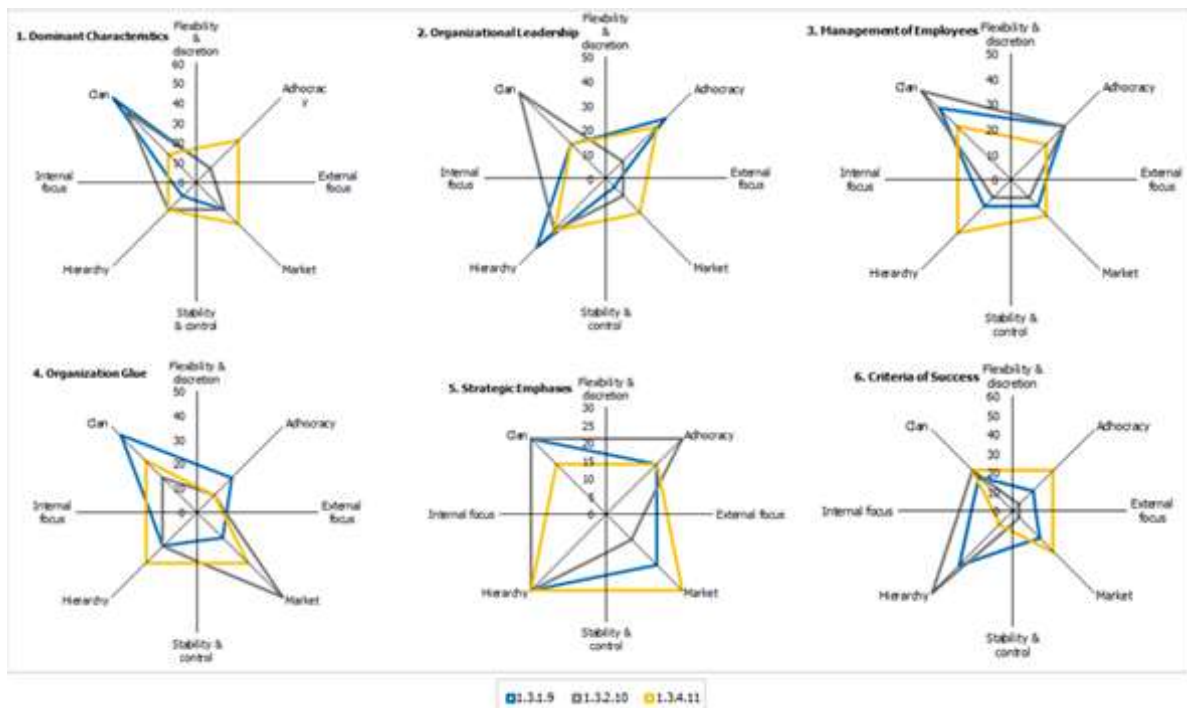


Figure 33 - Profiles for individual items related to case study 1 - Financial area

For respondent 1.3.1.9 (blue color), the dominant culture type on the Dominant Characteristics profile is the Clan culture, with the score of 60%, on the Organizational Leadership profile is Hierarchy, with the

score of 40%, on Management of Employees profile is Clan, with the score of 40%, on Organizational Glue profile is Clan with the score of 45%, on Strategic Emphases profile is Clan and Hierarchy, with the score of 30%, on Criteria of Success is Hierarchy, with the score of 45%. The results of the dominant culture of each profile for individual items are not congruent.

For respondent 1.3.2.10 (grey color), the dominant culture type on the Dominant Characteristics profile is the Clan culture, with the score of 50%, on the Organizational Leadership profile is Clan, with the score of 50%, on Management of Employees profile is Clan, with the score of 50%, on Organizational Glue profile is Market with the score of 50%, on Strategic Emphases profile is Clan, Hierarchical and Adhocracy with the score of 30%, on Criteria of Success is Hierarchy, with the score of 60%. Results of the dominant culture of each profile for individual items are not congruent.

For respondent 1.3.4.11 (yellow color), the dominant culture type on the Dominant Characteristics profile is the Market and Adhocracy culture, with the score of 30%, on the Organizational Leadership profile is Hierarchy and Adhocracy, with the score of 30%, on Management of Employees profile is Clan and Hierarchy, with the score of 30%, on Organizational Glue profile is Clan, Hierarchy and Market with 30%, on Strategic Emphases profile is Hierarchy and Market with the score of 30%, on Criteria of Success is Clan, Market and Adhocracy, with the score of 30%. Results of the dominant culture of each profile for individual items are not congruent.

The analysis of the results between these three respondents of the same Corporate Unit shows that in both cases the profiles for individual items are not congruent.

The Figure 34 shows the aggregated results of the individual items related to the cultural profile of the case study 1 – Financial area.

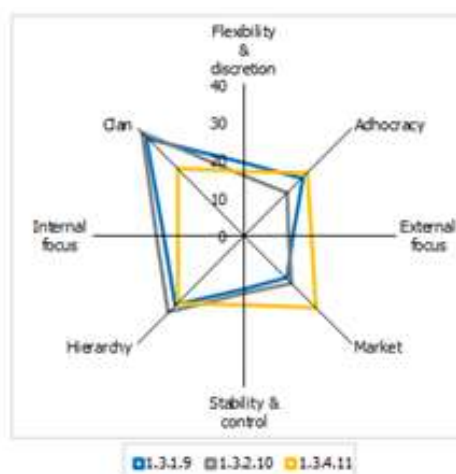


Figure 34 - Individual items combined profile of case study 1 - Financial area

The dominant culture type is Clan for two respondents, with a similar pattern. However, this similarity does not mean respondents act in the same way. The respondent 1.3.4.11 in spite of have a dominant Market Culture, he has a balance pattern (Clan Culture with the score of 25%, Hierarchy Culture with the score of 25%, Market Culture with the score of 27% and Adhocracy Culture with the score of 23%). Results shows some misaligned between members of the same Corporate Unit.

The Figure 35 shows the profiles for OCAI individual items related to case study 1 – Procurement area.

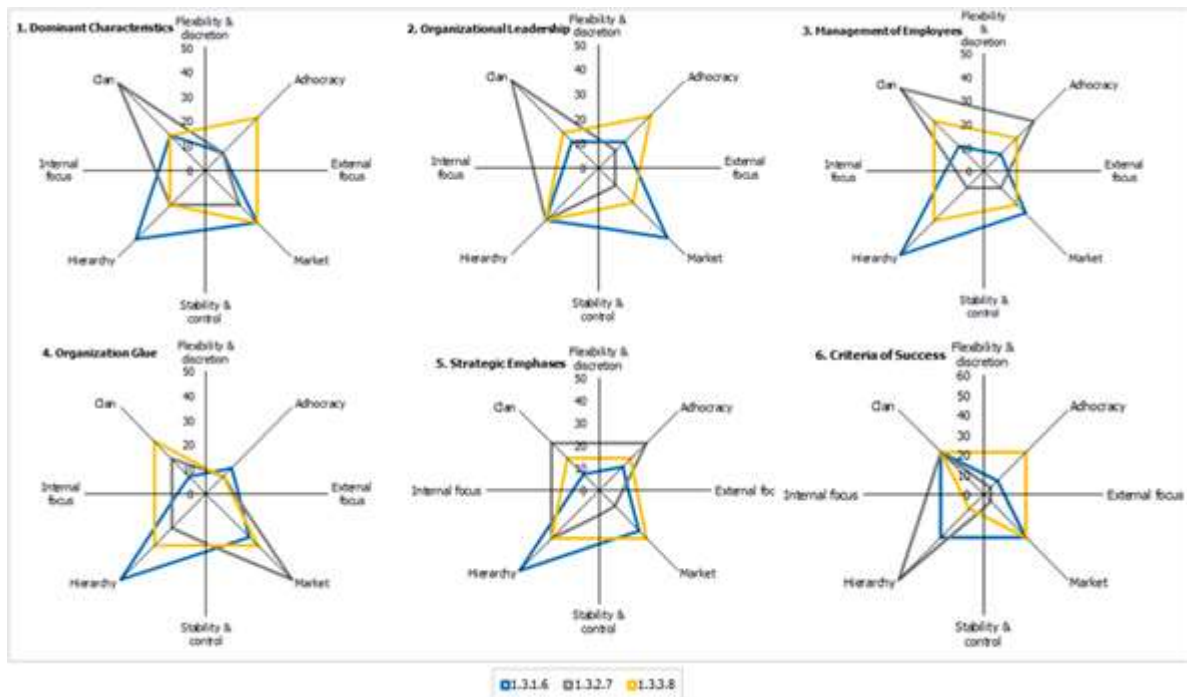


Figure 35 - Profiles for individual items related to Case study 1 - Procurement area

For respondent 1.3.1.6 (blue color), the dominant culture type on the Dominant Characteristics profile is the Hierarchy culture, with the score of 40%, on the Organizational Leadership profile is Market, with the score of 40%, on Management of Employees profile is Hierarchy, with the score of 50%, on Organizational Glue profile is Hierarchy with the score of 50%, on Strategic Emphases profile is Hierarchy, with the score of 40%, on Criteria of Success is Clan, Hierarchy and Market, with the score of 30%. The results of the dominant culture of each profile for individual items shows some congruence (four out of six are congruent).

For respondent 1.3.2.7 (grey color), the dominant culture type on the Dominant Characteristics profile is the Clan culture, with the score of 50%, on the Organizational Leadership profile is Adhocracy, with the score of 30%, on Management of Employees profile is Hierarchy, with the score of 30%, on Organizational Glue profile is Clan, Hierarchy and Market with the score of 30%, on Strategic Emphases profile is Market with the score of 30%, on Criteria of Success is Clan, Market and Adhocracy, with the score of 30%. Results of the dominant culture of each profile for individual items are not congruent.

For respondent 1.3.3.8 (yellow color), the dominant culture type on the Dominant Characteristics profile is the Market and Adhocracy culture, with the score of 30%, on the Organizational Leadership profile is Adhocracy, with the score of 30%, on Management of Employees profile is Hierarchy, with the score of 30%, on Organizational Glue profile is Hierarchy and Market with the of 30%, on Strategic Emphases profile is Hierarchy and Market with the score of 30%, on Criteria of Success is Clan, Market and Adhocracy, with the score of 30%. Results of the dominant culture of each profile for individual items are not congruent.

The analysis of the results between these three respondents of the same Corporate Unit shows that in both cases the profiles for individual items are not congruent.

The Figure 36 shows the aggregated results of the individual items related to the cultural profile of the case study 1 – Procurement area.

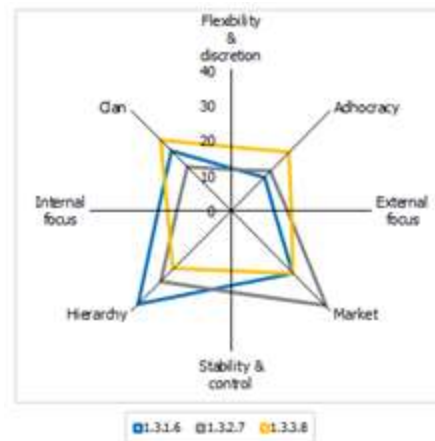


Figure 36 - Individual items combined profile of case study 1 - Procurement area.

The dominant culture is the Hierarchical Culture for the respondents 1.3.1.6, is Market Culture for respondent 1.3.2.7 and Clan for respondent 1.3.3.8. Results shows a misalignment between members of the same Corporate Unit, and a result the team are not aligned. This has a negative impact on the team performance and on the objectives to achieve. These differences can weaken the way the organization works and competes in the market.

4.2.2.2 Case study 2 – Industry: OCAI results

The Figure 37 shows the profiles for OCAI individual items related to case study 2 – Production area.

For respondent 2.1.1.1 (blue color), the dominant culture type on the Dominant Characteristics profile is the Market and Adhocracy culture, with the score of 30%, on the Organizational Leadership profile is Hierarchy, with the score of 80%, on Management of Employees profile is Clan, with the score of 80%, on Organizational Glue profile is Hierarchy with the score of 40%, on Strategic Emphases profile is Clan, with

the score of 40%, on Criteria of Success is Market and Adhocracy, with the score of 30%. Results of the dominant culture of each profile for individual items are not congruent.

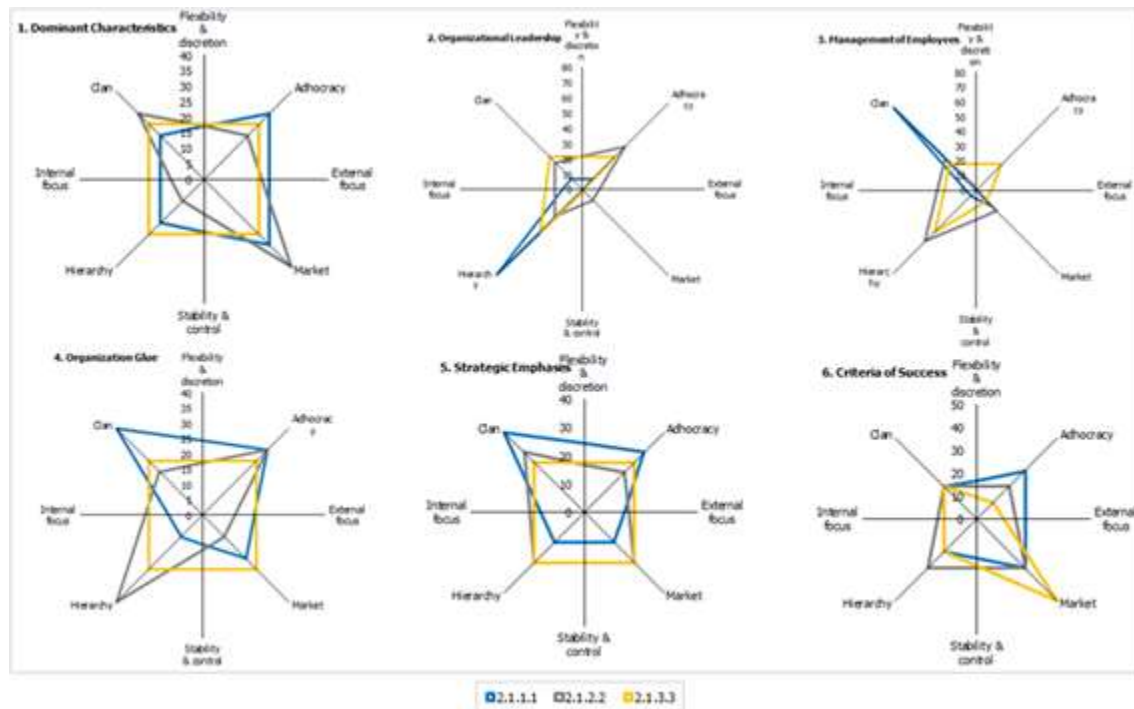


Figure 37 - Profiles for individual items related to Case study 2 - Production area.

For respondent 2.1.2.2 (grey color), the dominant culture type on the Dominant Characteristics profile is the Market Culture, with the score of 40%, on the Organizational Leadership profile is Adhocracy, with the score of 40%, on Management of Employees profile is Hierarchy, with the score of 50%, on Organizational Glue profile is Hierarchy with the score of 40%, on Strategic Emphases profile is Clan with the score of 30%, on Criteria of Success is Hierarchy and Market, with the score of 30%. Results of the dominant culture of each profile for individual items are not congruent.

For respondent 2.1.3.3 (yellow color), the dominant culture type on the Dominant Characteristics profile is balanced by all types of culture (Clan, Hierarchy, Market and Adhocracy), with the score of 25%, on the Organizational Leadership profile is Hierarchy, with the score of 40%, on Management of Employees profile is Hierarchy, with the score of 40%, on Organizational Glue profile is balanced by all types of culture (Clan, Hierarchy, Market and Adhocracy), with the score of 25%, on Strategic Emphases profile is balanced by all types of culture (Clan, Hierarchy, Market and Adhocracy), with the score of 25%, on Criteria of Success is Market, with the score of 50%. Results of the dominant culture of each profile for individual items are not congruent.

The analysis of the results between these three respondents of the same Corporate Unit shows that in both cases the profiles for individual items are not congruent.

The Figure 38 shows the aggregated results of the individual items related to the cultural profile of the case study 2 – Production area.

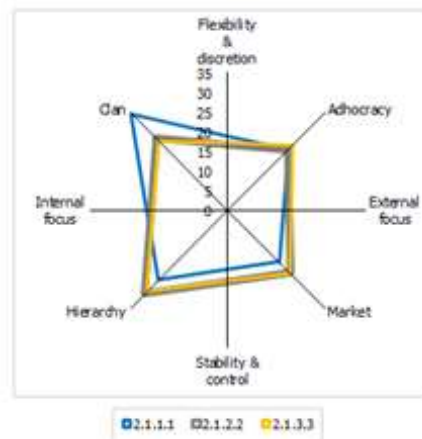


Figure 38 - Individual items combined profile of case study 2 - Production area

The dominant culture is the Clan Culture for the respondent 2.1.1.1. For the respondents 2.1.2.2 and 2.1.3.3 the dominant culture profile is Hierarchy, with the same pattern. However, this similarity does not mean respondents act in the same way. The respondents 2.1.2.2 and 2.1.3.3, in spite of a dominant Hierarchy Culture, revealed a balance pattern (Clan Culture with the score of 25%, Hierarchy Culture with the score of 30%, Market Culture with the score of 23% and Adhocracy Culture with the score of 22%). The respondent 2.1.1.1, in spite of dominant Clan Culture, has a similar pattern to the other respondents. Results show alignment between members of this Organization. This alignment increases the way the organization works and competes in the market.

4.2.2.3 Case study 3 – Services: OCAI results

The Figure 39 shows the profiles for OCAI individual items related to Case study 3 – Continuous Improvement area.

For respondent 3.3.1.1 (blue color), the dominant culture type on the Dominant Characteristics profile is the Adhocracy culture, with the score of 40%, on the Organizational Leadership profile is Adhocracy, with the score of 50%, on Management of Employees profile is Clan, with the score of 80%, on Organizational Glue profile is Clan with the score of 50%, on Strategic Emphases profile is Market and Adhocracy, with the score of 40%, on Criteria of Success is Market, with the score of 50%. Results of the dominant culture of each profile for individual items are not congruent.

For respondent 3.3.2.2 (grey color), the dominant culture type on the Dominant Characteristics profile is the Market Culture, with the score of 40%, on the Organizational Leadership profile is Clan and Adhocracy, with the score of 30%, on Management of Employees profile is Clan and Market, with the score of 40%, on Organizational Glue profile is Clan with the score of 40%, on Strategic Emphases profile is Clan with

the score of 40%, on Criteria of Success is Clan and Hierarchy, with the score of 40%. Results of the dominant culture of each profile for individual items are not congruent.

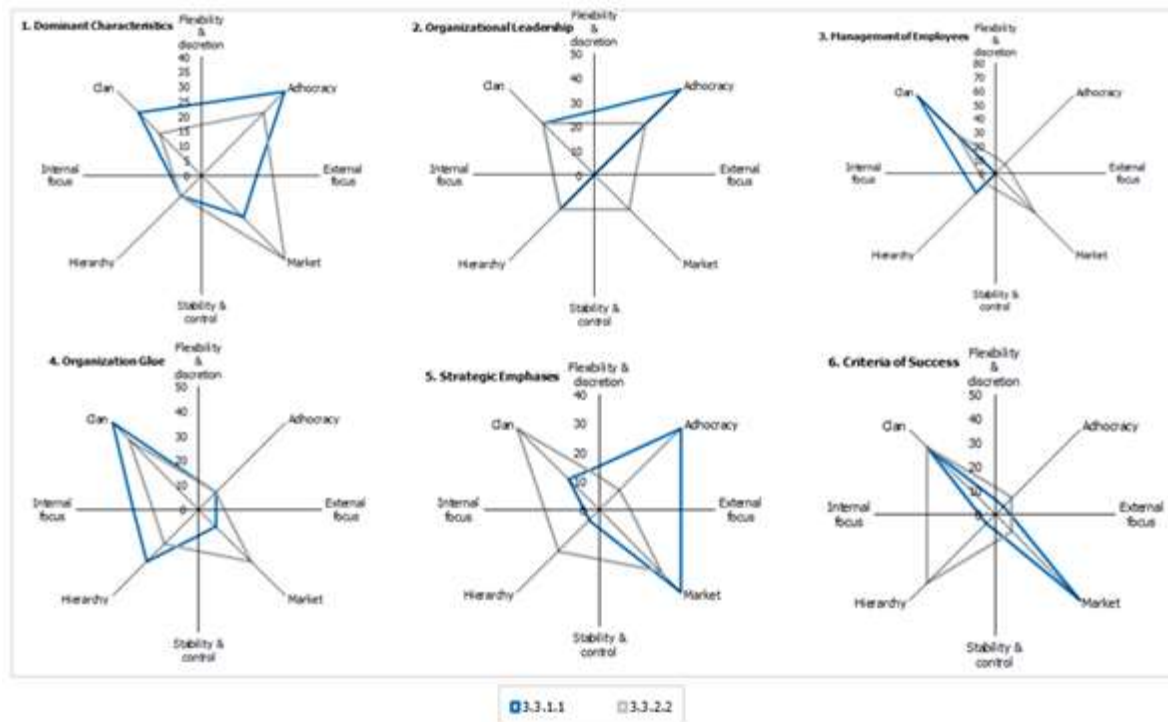


Figure 39 - Profiles for individual items related to Case study 3 - Continuous Improvement area.

The analysis of the results between these two respondents of the same Corporate Unit shows that in the profiles for individual items are not congruent.

The Figure 40 shows the aggregated results of the individual items related to the cultural profile of the case study 3 – Continuous Improvement area.



Figure 40 - Individual items combined profile of case study 3 - Continuous Improvement area.

The dominant culture in both cases is the Clan Culture, with a similar pattern. However, this similarity does not mean they act in the same way, because when we look to the individual profiles, these results

show misalignment. This misalignment can weaken the way the organization works and competes in the market.

4.2.2.4 Case study 4 – Services in public administration: OCAI results

The Figure 41 shows the profiles for OCAI individual items related to Case study 4 – Service area.

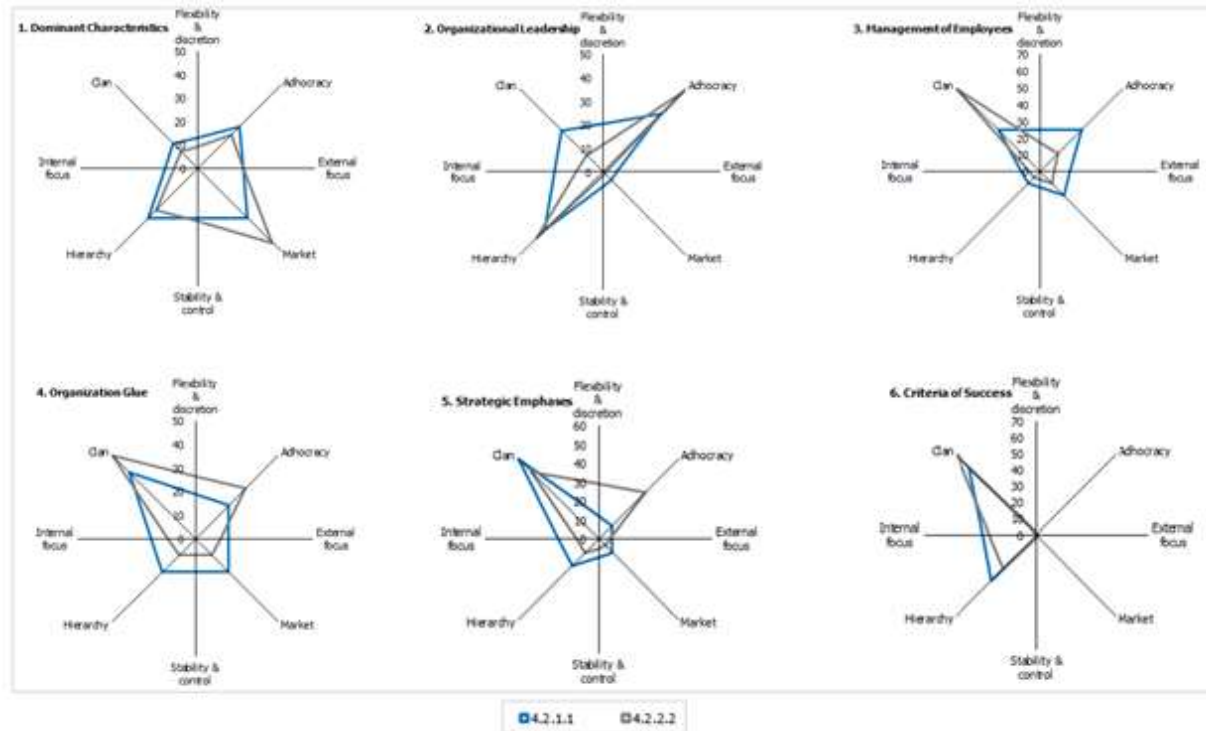


Figure 41 - Profiles for individual items related to Case study 4 - Service area.

For respondent 4.2.1.1 (blue color), the dominant culture type on the Dominant Characteristics profile is the Hierarchy and Market culture, with the score of 30%, on the Organizational Leadership profile is Hierarchy and Adhocracy, with the score of 30%, on Management of Employees profile is Clan and Adhocracy, with the score of 35%, on Organizational Glue profile is Clan with the score of 40%, on Strategic Emphases profile is Clan, with the score of 60%, on Criteria of Success is Clan, with the score of 60%. Results of the dominant culture of each profile for individual items shows some congruence (four out of six are congruent).

For respondent 4.2.2.2 (grey color), the dominant culture type on the Dominant Characteristics profile is the Market Culture, with the score of 45%, on the Organizational Leadership profile is Adhocracy, with the score of 50%, on Management of Employees profile is Clan, with the score of 70%, on Organizational Glue profile is Clan with the score of 50%, on Strategic Emphases profile is Clan with the score of 50%, on Criteria of Success is Clan, with the score of 70%. Results of the dominant culture of each profile for individual items are congruent, except on profile Organizational Leadership.

The analysis of the results between these two respondents of the same Corporate Unit shows that in the profiles for individual items shows some congruence (four out of six are congruent)..

The Figure 42 shows the aggregated results of the individual items related to the cultural profile of the case study 4 – Servicing area.

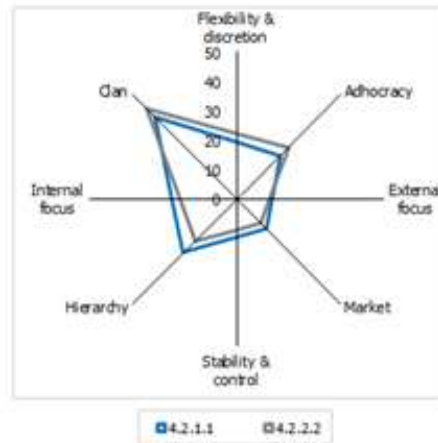


Figure 42 - Individual items combined profile of case study 4 - Service area.

The dominant culture in both cases is the Clan Culture, with a similar pattern. However, this similarity does not mean organization act in the same way. Results shows alignment between members of this organization.

4.2.2.5 Case study 5 – Services: OCAI results

The Figure 43 shows the profiles for OCAI individual items related to Case study 5 – Budgeting area.

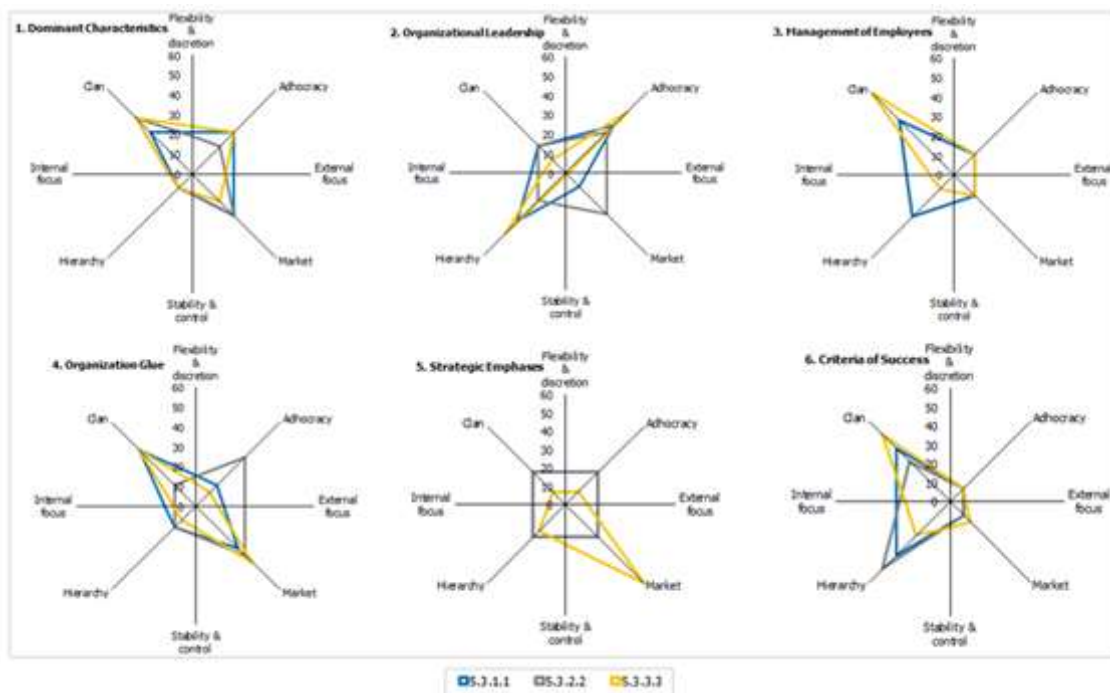


Figure 43 - Profiles for individual items related to Case study 5 - Budgeting area.

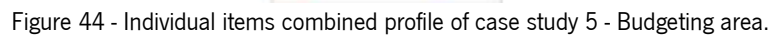
For respondent 5.3.1.1 (blue color), the dominant culture type on the Dominant Characteristics profile is the Clan, Market and Adhocracy culture, with the score of 30%, on the Organizational Leadership profile is Hierarchy and Adhocracy, with the score of 35%, on Management of Employees profile is Clan, with the score of 40%, on Organizational Glue profile is Clan with the score of 40%, on Strategic Emphases profile is Clan, Hierarchical, Market and Adhocracy with the score of 25%, on Criteria of Success is Clan and Hierarch, with the score of 40%. Results of the dominant culture of each profile for individual items are not congruent.

For respondent 5.3.2.2 (gray color), the dominant culture type on the Dominant Characteristics profile is the Clan Culture, with the score of 40%, on the Organizational Leadership profile is Market and Adhocracy, with the score of 30%, on Management of Employees profile is Clan, with the score of 40%, on Organizational Glue profile is Market and Adhocracy with the score of 35%, on Strategic Emphases profile is Clan, Hierarchical, Market and Adhocracy with the score of 25%, on Criteria of Success is Hierarchy, with the score of 50%. Results of the dominant culture of each profile for individual items are not congruent.

For respondent 5.3.3.3 (yellow color), the dominant culture type on the Dominant Characteristics profile is balanced by all types of culture is Clan, with the score of 40%, on the Organizational Leadership profile is Hierarchy, with the score of 44%, on Management of Employees profile is Clan, with the score of 60%, on Organizational Glue profile is Clan and Market, with the score of 40%, on Strategic Emphases profile is balanced by all types of culture Market, with the score of 60%, on Criteria of Success is Clan, with the score of 50%. Results of the dominant culture of each profile for individual items are not congruent.

The analysis of the results between these three respondents of the same Organization shows that in both cases the profiles for individual items are not congruent.

The Figure 44 shows the aggregated results of the individual items related to the cultural profile of the case study 5 – Budgeting area.



4.3 Results synthesis

4.3.1. BDILCO part 2 - Denison model results

Table 14 - Denison model results synthesis

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On case study 1, all areas analyzed, apart from the Procurement area, need to watch out to these results because they give a signal that these areas have space to improve their openness to implement the Lean Thinking. For example, for the service area of case study 1, an interviewee felt that was not involved or was not capable to adapt to the changes. On the other case studies, the areas analyzed are well related to the openness to implement Lean Thinking.

Related to the nationality of the organizations, it seems there was not a significant dissimilarity among the results, as the case study 2 (is the only foreign organization), has similar results.

4.3.2. BDILCO part 3 - CVF model results

The results of the third part of the BDILCO questionnaire revealed a lot of non-congruent situations (Table 15). For example, case study 1 most respondents answers indicated non-congruent at the individual and organization level.

Table 15 - CVF results synthesis

Case study nr. (# interv.)	Production			Service			Corporate														
	Respondents	Individual	Organization	Respondents	Individual	Organization	EHS			Procurement			Financial			Continuous Improvement			Budgeting		
							Respondents	Individual	Organization	Respondents	Individual	Organization	Respondents	Individual	Organization	Respondents	Individual	Organization	Respondents	Individual	Organization
Case study 1 (14)	1.1.1.12	NC	NC	1.2.1.3	C	C	1.3.1.1	C	NC	1.3.1.6	SC	NC	1.3.1.9	NC	NC						
	1.1.1.13	NC		1.2.1.4	SC		1.3.1.2	C		1.3.1.7	NC		1.3.1.10	NC							
	1.1.1.14	SC		1.2.1.5	NC					1.3.1.8	NC		1.3.1.11	NC							
	2.1.1.1	NC																			
Case study 2 (3)	2.1.1.2	NC	NC																		
	2.1.1.3	NC																			
Case study 3 (2)																3.3.1.1	NC	C			
															3.3.1.2	NC					
Case study 4 (2)				4.2.1.1	SC	C															
				4.2.2.2	SC																
Case study 5 (3)																			5.3.1.1	NC	C
																		5.3.1.2	NC		
																		5.3.1.3	NC		

C: Congruent; SC: Some Congruence; NC: Not Congruent

Even, for the case study 3 and 5 which Denison model results provided good results, revealed at the individual level a situation of non-congruent. In case study 2, which also had good results on Denison and Neale model, revealed at the individual level and organization level a situation of non-congruence. The case study 4 results show some congruence at the individual level and a total congruence at the organizational level.

The Table 15 shows the importance of analyzing the predominant profile of the organization, to get the knowledge about the real congruence at the individual level and organizational level.

The collected results shows that the difficulty in integrating lean do not depends on organization business sector (industry/services) and business areas. For example, for the case study 1 there was no standard related with the answers from production area respondents or service/corporate areas (departments

farthest of operations) respondents. With these, the sub-question sRQ1.2 raised in the section 1.3 of this thesis: "*Is it more difficult this integration in the departments farthest of operations?*" is answered.

These results justify the need to all organizations to know their organization's culture type, because organizational success depends on the extent to which the organization's culture matches the type preferred and, consequently, the demands of the competitive environment. This is a valid assumption for national or international organizations.

5. INTEGRATION OF LEAN THINKING INTO ORGANIZATIONAL CULTURE MODEL DEVELOPMENT

This chapter describes the model developed to integrate the Lean Thinking Principles in the Organizational Culture of an organization. This model was named “Integration of Lean Thinking into Organizational Culture (ILTOC)” model. This model is a three-dimensional model because it relates the three levels of Organizational Culture of Schein, the five Lean Thinking Principles and the 4P model of the Toyota Way. This model includes a methodology that is divided in five phases.

5.1 Integration of Lean Thinking into Organizational Culture model dimensions

From the literature review conducted, it was not possible to identify a model that integrates the Lean Principles on the Organizational Culture of the organizations. Thus, with the objective to develop a model addressing this integration, the proponent of this thesis initiated by performing a detailed literature review to identify all the characteristics of Organizational Culture and Lean Thinking to demonstrate that Lean Thinking can be considered an Organizational Culture (Amaro et al., 2021).

The model proposed intends to support organizations to integrate the Lean Thinking Principles on the Organization Culture of any organization. The Figure 45 presents the general overview of the model.

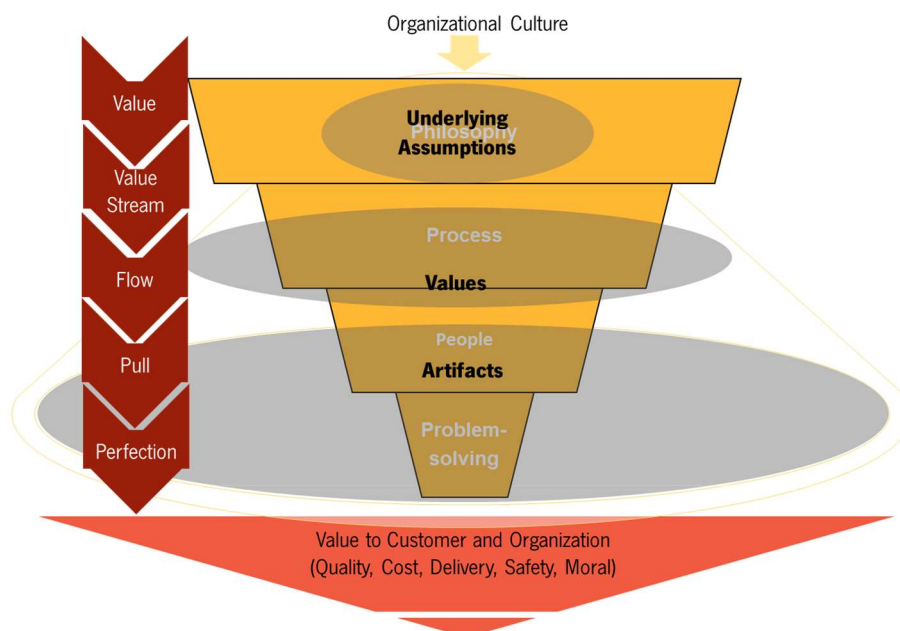


Figure 45 - Integration of Lean Thinking into Organizational Culture (ILTOC) model

Three dimensions were considered: 1) three levels of Organizational Culture of Schein (1984); 2) five Lean Thinking Principles (Womack & Jones, 1996) and 3) 4P model of the Toyota Way (Liker, 2004). The inclusion of the three dimensions allows to reach the value to customer and organization in five goals: 1)

Quality; 2) Cost; 3) Delivery; 4) Safety and 5) Moral. The following sections explain in detail the dimensions of the ILTOC model.

5.1.1 Three levels of Organizational Culture of Schein

The Schein's model (Schein, 1984) was considered as a dimension on the ILTOC because it considers that Organizational Culture could enable or inhibit a transformation in an organization, as reviewed in the section 2.1.1.1. Figure 46 presents only the part of the model related to three levels of Organizational Culture.

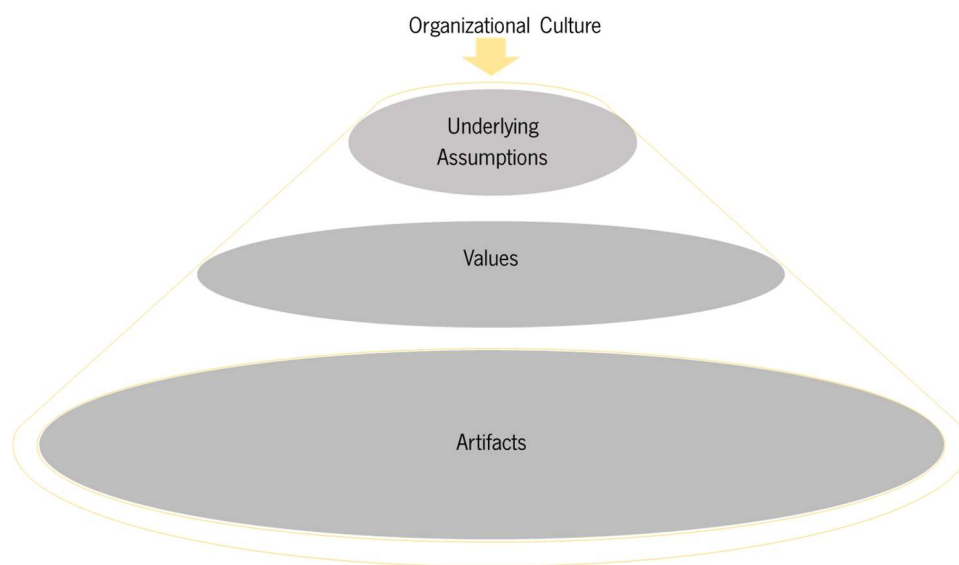


Figure 46 - Three level of Organization Culture of Schein in ILTOC

The Underlying Assumptions of this model are the invisible part of an organization that should become visible. So, it is important that all people in an organization know such assumptions to be aligned to the same purpose, working together and developing patterns for all to collaborate and to solve problems, ensuring organizational survival and growth (McLaughlin, P; Bessant, J.; Smart, 2010). To help to put visible the Underlying Assumptions, the proponent of this thesis created the BDILCO, explained in section 3.2.1. For example, in a particular organization known by the proponent of this thesis, in spite of the employees having a badge with the name, mission and values of the organization, when asked them about what are the values, they do not know. This means that it is not enough to have this, i.e., it is necessary that employees are aware of those values and act accordingly. They even do not know how to apply and translate those values in actions to pursue customer needs.

Espoused values are the second level that is closely related to underlying assumptions, as given by the previous example. These are comprised of the principles and standards within an organization, many times established by a manager without engagement of employees. Nevertheless, employees need to be

involved to feel that they belong to the organization and feel pride in it. This enables the values to be intrinsically owned by the employees. Dialogues, discussion and sharing standards proposals, before its implementation are important to promote espoused values and effective adhesion to it by the employees. This is what the model is intended to do.

The third level corresponds to the artifacts that is the easiest element to be aware of. It comprises the objects which can be seen or experienced. Nevertheless, the observable data and context could be difficult to interpret. This means that an effort to quantify is relevant in this level. In the model, this level is evaluated by the meetings, number of meetings and duration, the dashboards, if existent, with the objectives of the organization, the flexible timetable, the communication means and type, the key performance indicators, among others.

5.1.2 Five Lean Thinking Principles

The five Lean Thinking principles, as reviewed in section 2.2.2.1., emerged as a request from organizations to the authors of “The Machine that Changed the World”. The organizations were anxious to implement Lean Thinking. Thus, the proponent of this thesis considered that these are fundamental to any organization and must be natural (people do not have to think of how to apply it) that wants to integrate Lean Thinking in Organizational Culture. Figure 47 presents the five lean principles.

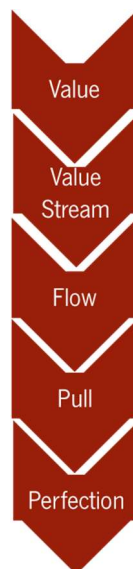


Figure 47 - The five Lean Thinking Principles

The organization needs to create conditions to implement such principles in a natural way, i.e., to organize meetings to pull the value, organize workshops to operationalize concepts of “client”, “value” and “waste”. Then, follow the five principles. More details will be provided in the section 5.2.

5.1.3 The 4P model

Liker (2004) described a pyramid of four levels, namely Philosophy, Process, People and Problem Solving (4P) as the organizational hierarchy of the “Toyota Way”. The Figure 48 present these levels in an adapted pyramid. Compared to the original in section 2.2.2.2, it is inverted to align it with “Value” from the five Lean Thinking principles. These components were underlying in 14 Management Principles, as referred in section 2.2.2.2 that have been operationalized in all aspects of TPS.

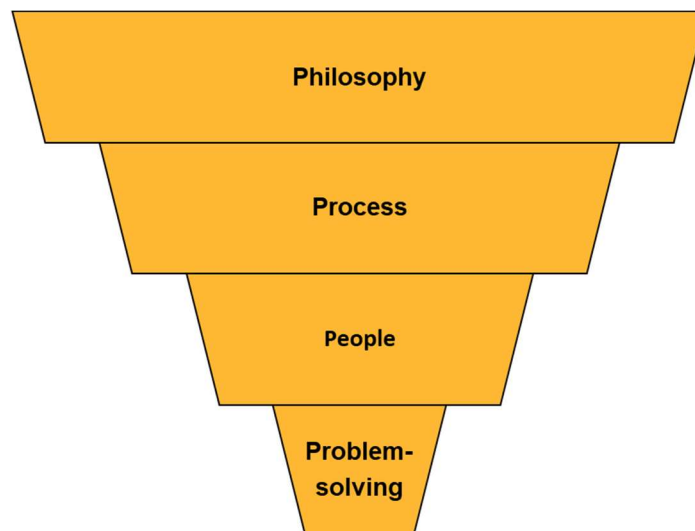


Figure 48 - The 4P model of the Toyota Way, adapted by author of this thesis

The first component is Philosophy and embodies the first of the 14 principles and underscores the importance of shared vision and long-term strategic thinking, Figure 49.

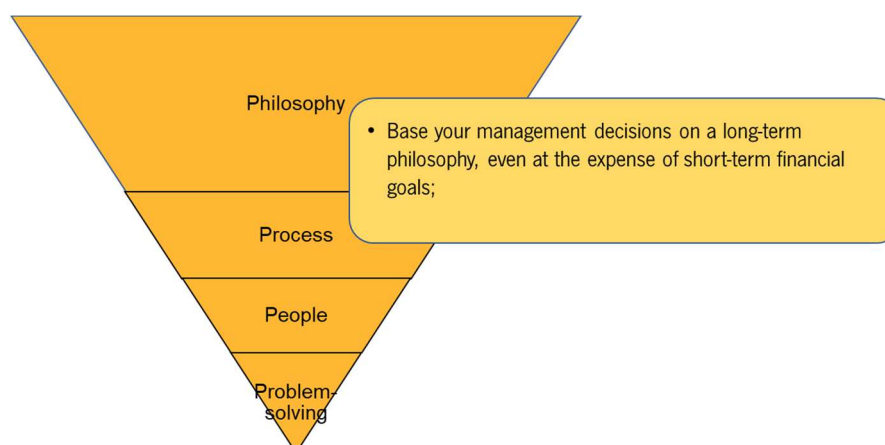


Figure 49 - The 4P model, first level

The second level is Process, with the goal to build an efficient and effective production processes (reflecting TPS principles 2–8) and is based on the trust that “the right process will produce the right results”. Figure 50 presents this level with the main characteristics, as defined by Liker (2004).

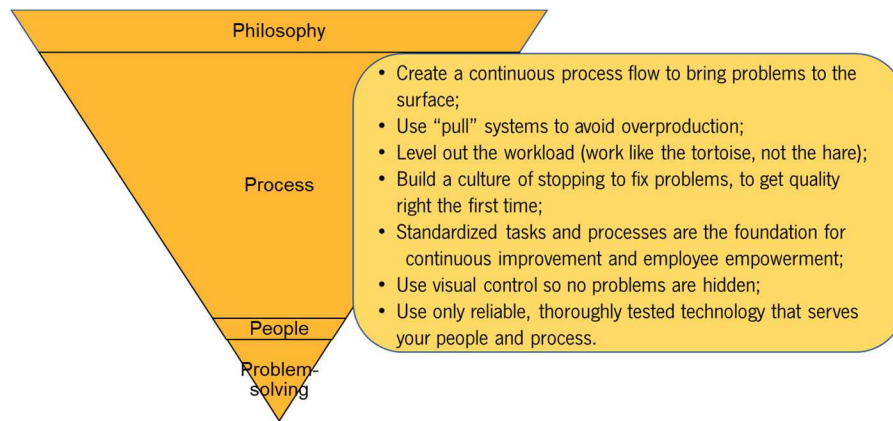


Figure 50 - The 4P model, second level

In this level, a system overview perspective must be adopted to study the system as a whole and identify all failures within organizational processes. The process should be designed in a way that avoid or, at least, detect and neutralize errors before they occur. Within this systems perspective, all employees are empowered to stop all kind of work they are doing immediately if there is any deviation from established quality standards. The core elements of the TPS are the visual controls, that combined with a culture of transparency allows identification and communication of defects in production (Serembus et al., 2012).

The third level is People, that is represented in Figure 51 with the main characteristics, as defined by Liker (2004).

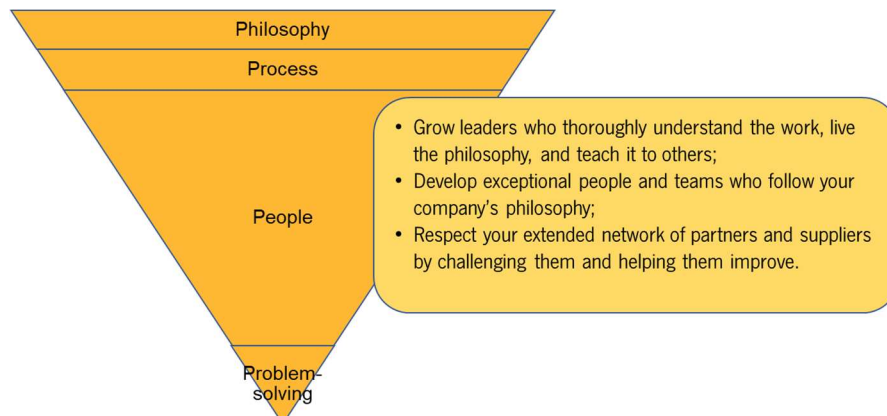


Figure 51 - The 4P model, third level

People is the most important asset of the organizations and need to have conditions to grow. This means to train them for, later, they could be coaches of others and they could become thinkers by continuously solving problems (Alves et al., 2012). In this way, it is expected that they critically examine their workstations, the process and materials, information and people flow to identify problems and reach to their causes on an ongoing basis. Then, they could propose improvements to transform the production system in a lean production system. With this spirit, they could effectively use technology, putting it to their own service (Bittencourt et al., 2021; Monden, 1998; Spear & Bowen, 1999).

People should focus on getting things right the first time, if face a situation without the possibility of feedback. In this case, they will avoid cost duplication and related risk. However, if it is important to have feedback, should do the work in small batches or, even, one-piece flow (Sekine, 1990). With client feedback, supporting the reach of best practices it is possible to standardize tasks.

Fourth level is Problem-Solving, that is represented in Figure 52 with the main characteristics, as defined by Liker (2004).

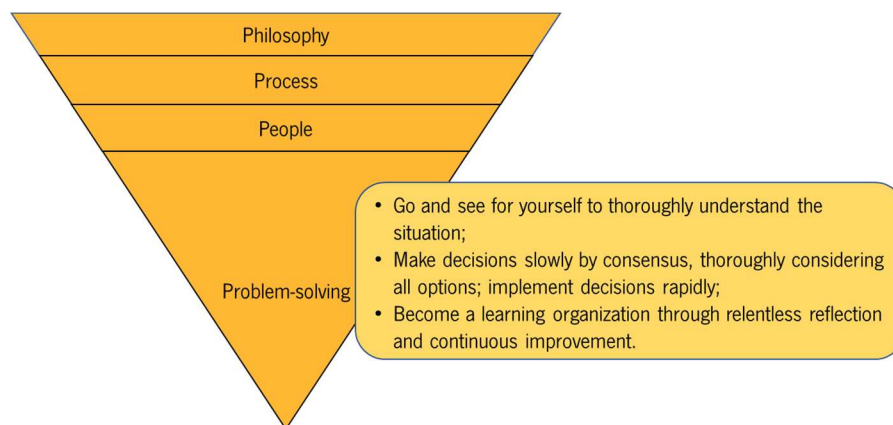


Figure 52 - The 4P model, fourth level

Lean provides an environment where workers are all the time dissatisfied with the status quo and need to identify problems and devise possible solutions. In this way, they will be in constant self-improvement and learning, supported by continuous improvement.

5.1.4 Linking between the three dimensions

Each dimension described in early points, has, individually, a big impact for the purpose that were created. However, in the opinion of the proponent of this thesis and supported by the research and his professional experience, the interconnection between these three dimensions will allow organizations to truly integrate the five Lean Thinking Principles on their Organizational Culture.

To apply the interconnection between these three dimensions a model was created, the ILTOC model. This model allows organizations to cross-reference all the characteristics of each dimension to make the five Lean principles part of the Organizational Culture in an integrated way.

5.2 Phases to implement the ILTOC model

The implementation of ILTOC model is based in five phases, namely:

- Phase 1 – Train the team (Basic concepts; Process fundamentals; Problem-Solving tools);

- Phase 2 – Identify the three levels of Organization Culture (Artifacts; Values; Underlying assumptions);
- Phase 3 – In the value stream selected identify the Lean Principles (Value; Value Stream; Flow; Pull; Perfection);
- Phase 4 – In the value stream selected define actions (Increase the Value of the cultural traits of the organization aligned with the Lean Principles; Apply the 4P model to support the last step; Lead teams to implement Lean Thinking);
- Phase 5 – Integrate Lean Principles into Organizational Culture (Apply the steps of the three previous phases in all Value Streams of the company; Build a process of Continuous Improvement).

The Figure 53 present these phases and corresponding steps/actions. The phase 1 consists in the team training. In this phase, the focus of the training is on Basic concepts, Process fundamentals and Problem-Solving tools. The phase 2 aims to identify the three levels of Organization Culture. In this phase are identified the Artifacts, the Values, and the Underlying assumptions. The phase 3 is the application of the Lean principles, starting by the identification of the value stream to study and its diagnosis. The team must be involved in this identification. In this phase is identified the Value, the Value Stream, the Flow, the Pull, and the Perfection. In the phase 4, the actions are defined and applied to the selected Value Stream. Also, in this phase are identified and implemented actions to increase the value of the cultural traits of the organization aligned with the Lean principles. Finally, in this phase, apply the 4P model to support the last step and lead teams to implement Lean Thinking. The phase 5 consists in the integration of the Lean principles into Organizational Culture. In this phase are applied the steps of the three previous phases in all Value Streams of the company and build and maintain a process of continuous improvement.

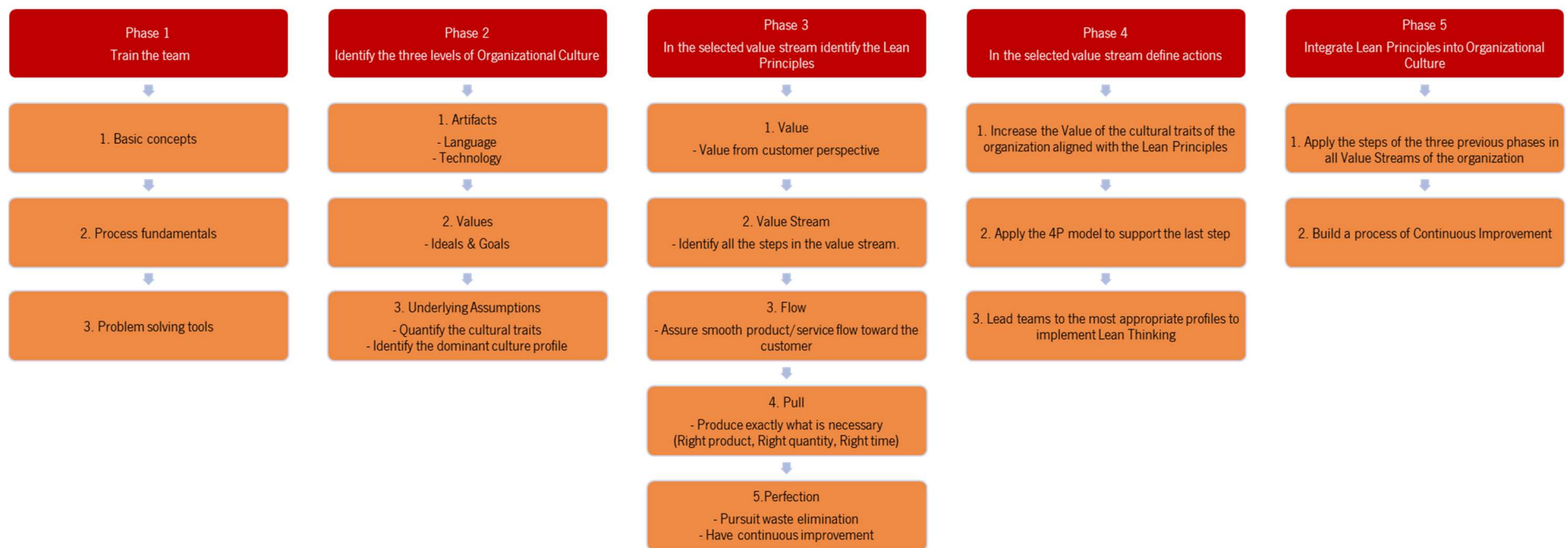


Figure 53 - Phases to implement ILTOC model

5.2.1 Phase 1 – Train the team

The goal of this phase is to provide the team with the same knowledge about: 1) basic concepts; 2) Process fundamentals; 3) Problem solving tools, as presented in Figure 54.

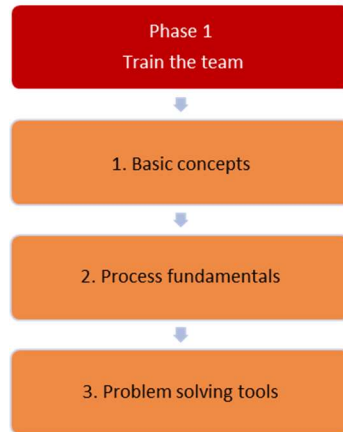


Figure 54 - Steps of the phase “Train the team”

The basic concepts are about Lean Thinking, operations types, types of wastes and inconsistencies. The process fundamentals are about the definition of process, types of processes, Business Process Management (BPM) and Business Process Management Notification (BPMN). The problem-solving tools are about Pareto chart, 5W2H, Ishikawa diagram and the 5 Why methodology (Suzaki, 1993). The training modules are presented in Appendix 2.

5.2.2 Phase 2 – Identify the three levels of Organization Culture

The goal of this phase is to document/quantify the three levels of Organizational Culture defined by Schein (2004) described in section 2.1.1.1. For this, this phase is decomposed in three steps, as showed in Figure 55.



Figure 55 - Steps of the phase “Identify the three levels of Organizational Culture”

Table 16 summarizes some of the elements of each level of the Schein model of Organizational Culture.

Table 16 - Levels of Organizational Culture
(adapted from Schein, 2004)

Levels	Elements
Artefacts	Dress codes Architecture: - Open spaces - Leisure areas Language Technology and products Manners of address Emotional displays Published lists of values Organization charts ...
Espoused values	Espoused goals, ideals, norms, standards, moral principles, and other untestable premises
Underlying assumptions	Dig beneath the surface of values by observing behavior carefully, noting anomalies, inconsistencies, or phenomena that remain unexplained that is elicited from the insiders

With the goal to obtain a deeper level of understanding, to decipher the pattern, and to align the future behavior correctly, it must be visible, and then understandable more fully the basic underlying assumptions. For that, Denison and Neale (1999) model and Cameron and Quinn (2006) model were used through the application of the BDILCO questionnaire to infer about these.

The quantification of actual state is fundamental for the start-up of the integration of the Lean Thinking on the culture of the organization. This will allow the evaluation of the contribution of this integration for collaborators and for the organization. Simultaneously, it is observed the processes of the value stream where it will be applied the first's four parts of the ILTOC model.

Examples of measures to quantify are:

- Number of people;
- Percentage of hours stayed in Organization after time defined;
- Percentage of absenteeism;
- The different goals defined of the value stream to be analyzed and percentage of achievement;
- The key vectors (KPI's), in the value stream to be analyzed: 1) Quality; 2) Cost; 3) Delivery; 4) Safety and 5) Moral.

5.2.3 Phase 3 – In the selected value stream identify the Lean Thinking principles

The phase 3 is decomposed in five steps that correspond to the Lean Thinking principles, as presented in Figure 56.

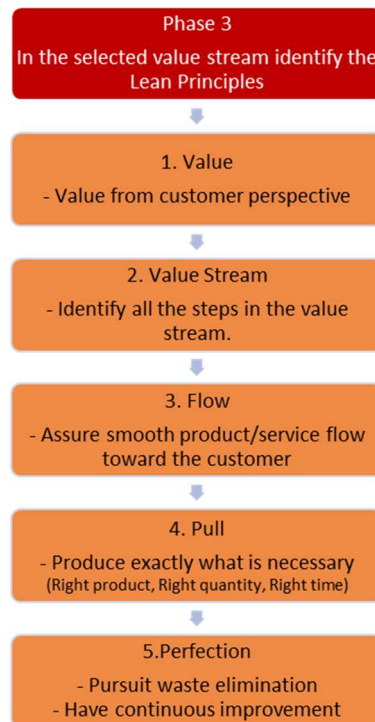


Figure 56 - Steps of the phase “In the selected value stream identify the Lean Principles”

Firstly, it is necessary to identify the value stream where this model will be applied. After this selection, it is important to define where and when to start and to finish the value stream selected.

Based on the definition made in section 2.2.2.1 about each Lean Thinking Principle, the first step is to identify the value that this value stream delivers. For this identification it is necessary to involve all the departments' leaders that participate in the identified value stream to, jointly with the Commercial area, get the real perception of the value to deliver.

The second step is to identify all the tasks involved in the process of this value stream. It is recommended to have an updated process description of all activities, otherwise, it is necessary to update it.

The third step is to verify if the tasks flow (start and finish without interruptions) in the value stream selected. For this identification, it is very important that the process description clearly defines when each activity starts and finish indicating the corresponding inputs and outputs.

The fourth step is to apply the pull system. For this, it is necessary to identify all the triggers through the value stream to apply the pull system, ensuring that each internal customer timely receives their desired information to provide the final information to the external customer when he/she wants it.

The fifth step is to pursue the perfection. For this, practices of continuous improvement should be adopted in the value stream selected. One example of a methodology to support the continuous improvement is the daily Kaizen meetings (Appendix 3) (Kaizen Institute, 2021).

5.2.4 Phase 4 – In the selected value stream define actions

This fourth phase is divided in three main steps, Figure 57 presents such steps.

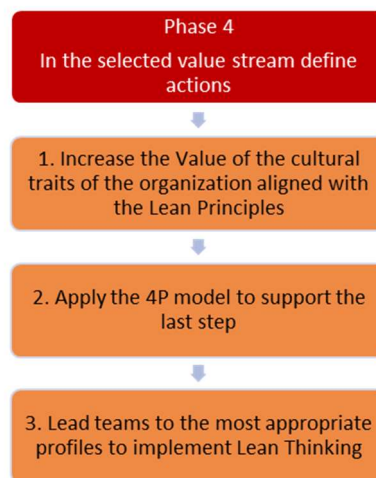


Figure 57 - Steps of the phase “In the selected value stream define actions”

The first step is to increase the value of the cultural traits of the organization aligned with the Lean Principles, based on data collected on the questionnaires made in third phase by BDILCO. For this it is important to define actions for each individual item (Organizational Characteristics, Organizational Leader, Management of Employees, Organizational Glue, Strategic Emphasis and Criteria of Success) on each type of culture. Such actions, based on Table 4 of section 2.1.1.3, could be added in a record sheet with questions for each individual item. The Table 17 presents an example of the record sheet template to collect the actions to be developed for the individual item Dominant characteristics and a similar table is created for each individual item that are in Appendix 4.

Table 17 - Record sheet template to collect actions to be developed for individual item Dominant characteristics (adapted from Cameron and Quinn, 2006)

Actions to be developed - Dominant characteristics	
Clan Culture	Adhocracy Culture
What do I stop doing or do less of?	What do I stop doing or do less of?
What do I should start doing or do more of?	What do I should start doing or do more of?
Hierarchical Culture	Market Culture
What do I stop doing or do less of?	What do I stop doing or do less of?
What do I should start doing or do more of?	What do I should start doing or do more of?

The second step is to apply the 4P model to support the first step of this phase. Putting into practice the phrase “If You Can’t Measure It, You Can’t Improve It” of Peter Drucker, a template of a record sheet describing the 4P model principles in a table format was designed to identify the gap between the current and future situation and to define actions that will reduce the gap. An example is presented in Table 18.

Table 18 - Record sheet template to identify the gap between the current and future situation and to define actions

Level	Principle	Actual condition	Gap	Action	Responsible	Date
1 - Long-Term philosophy	1 - Base your management decisions on a long-term philosophy, even at the expense of short-term financial goals					
2 - The right process will produce the right results	2 - Create a continuous process flow to bring problems to the surface					
	3 - Use “pull” systems to avoid overproduction					
	4 - Level out the workload					
	5 - Build a culture of stopping to fix problems, to get quality right the first time					
	6 - Standardized tasks and processes are the foundation for continuous improvement and employee empowerment					
	7 - Use visual control so no problems are hidden					
	8 - Use only reliable, thoroughly tested technology that serves your people and processes					
3 - Add value to the organization by developing your people	9 - Grow leaders who thoroughly understand the work, live the philosophy, and teach it to others					
	10 - Develop exceptional people and teams who follow your company’s philosophy					
	11 - Respect your extended network of partners and suppliers by challenging them and helping them improve					
4 - Continuously solving root problems drives organizational learning	12 - Go and see for yourself to thoroughly understand the situation					
	13 - Make decisions slowly by consensus, thoroughly considering all options; implement decisions rapidly					
	14 - Become a learning organization through relentless reflection and continuous improvement					

The third step of this phase is to lead teams to the most appropriate profiles to implement Lean Thinking. In this step, are developed actions to implement the 14 Management Principles described in Table 6, section 2.2.2.2. and to align the profiles of the team to implement Lean Thinking. To achieve this, a new training to develop new capabilities on teams are needed. The main points developed in this training should be:

- Connecting strategy, goals, and meaningful purpose;
- Discovering better ways of working;
- Delivering value efficiently to the customer;
- Enabling people to lead and contribute to their fullest potential.

To support the achievement of the previous points a fundamental behavioral shift illustrates the challenge of building everyday leadership, with each representing a disruption from the typical way people behave (exhibit). The three main shift behavior should be:

- Asking questions rather than giving answers;
- Digging for root causes of problems rather than looking for quick fixes;
- Connecting the future to today, not by making grand pronouncements, but by translating the organization's purpose and business objectives into practical targets that people can work toward each day.

The more difficult part is to apply (behave) in every day working life. For this, meetings should be appointed to give feedback to the leaders about the way they behave during these meetings. Table 19 shows a record sheet template to get this information and define actions to improve the gaps identified.

Table 19 - Record sheet template for behavioral feedback from leaders

Theme of the meeting:		Observed person:		Date:	
Item	Observed behavior	Gap	Action	Responsible	Date
1					
2					
3					

The behaviors of the leaders pull the behaviors of all the team to an open and participative change to a Lean Culture.

5.2.5 Phase 5 – Integration of the Lean Principles into Organizational Culture

The integration of the Lean principles into Organizational Culture phase is divided in two main steps, as presented in Figure 58.

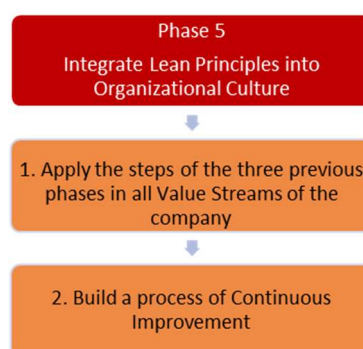


Figure 58 - Steps of the phase Integrate Lean Principles into Organizational Culture

The first step is to apply the steps of the three previous phases in all Value Streams of the company. This loop of actions is made until all Value Streams are mapped. The second step is important to build a process of Continuous Improvement. According to Liker (2004) “*One must standardize, and thus stabilize the process, before continuous improvements can be made*”. For this it is important to raise following questions:

- When was the last time that was made a real effort to instill a continuous improvement culture?
- How investment and effort was made to identify some improvements, and change how people work?
- How much commitment was take — of time, money, human energy?
- How the performance was improved after the first wave of changes?
- How many workers changed their daily routines? How many reverted to their old habits?

Also, it is important to create a continuous improvement process. Figure 59 presents the macro process of continuous improvement defined.



Figure 59 - Macro Process Continuous Improvement

To apply this macro process, the teams must create the following routines:

- Daily meeting (15 minutes);
- Two hours meeting (weekly);
- Two hours meeting (monthly).

On the daily meeting should be analyzed:

- Accomplishment of the tasks and respective outputs defined for the previous day. If not, why;
- Flow interruption alerts;
- Review of the day's tasks and potential bottlenecks;
- Follow up of the “DO” actions.

On the weekly meeting should be analyzed:

- Analysis of the problems identified during the week;
- Complete open PDCA:
- Initiated the PDCA for each problem identified;
- Weekly Indicators Analysis;

- Analysis of next week's planning.

On the monthly meeting is analyzed:

- Finalize unfinished issues;
- Work in points more complex;
- Analyze all the KPI defined;
- Identify training needs;
- Confirm that all standards defined during the month are published and the team have the necessary training (if applicable).

In this last phase, it is made firstly one analysis of the lessons learned on the actions and results of the work made on the first value stream (the pilot area). After this analysis, it is selected another value stream and applied all the previous phases.

Also, it is expected that the organization have the maturity to develop the principles applied early. The organization should be capable to understand if these principles are suitable and diligently practicing them to achieve high performance. At the same time, it continues to add value to customers and society, being competitive and profitable.

5.3 Summary

This chapter presents the development of the Integration of Lean Thinking into Organizational Culture (ILTOC) model. This model is a three-dimensional model composed by the three levels of Schein model, five Lean Thinking principles and the 4P model. It is decomposed in five main phases and each phase is decomposed in two to five steps. It is not a trivial model as it is related to behaviors, attitudes, and transformation. It includes a methodology that guides a team to implement Lean.

Other models have been proposed as revealed in the literature review. However, the ILTOC model has unique specificities, namely, it combines the traditional Organizational Culture models (Schein model, Denison and Neale model, CVF) with the Lean Thinking mind-set by addressing Lean Thinking principles and the 4P model.

The model developed could take more than a year to implement. It depends in the expertise of the team but, mainly, to the openness of the company to implement it and the current Organizational Culture of the company, as referred in the previous chapter. Although the model was developed with Portugal in

mind, the author consider that this model could be applied to foreign organizations, as the will to change and improve is a common factor to all countries.

The next chapter presents a case study where the ILTOC was implemented. With this, the author of this thesis expected to collect feedback about the viability of this model for companies that want to implement Lean Thinking.

6. ILTOC MODEL IMPLEMENTATION IN A CASE STUDY

Once the ILTOC model was developed, it was applied in a Portuguese organization. For this application, a case study protocol defined in section 3.2.2 was used to conduct and facilitate its implementation in the field. To this end, one case study was carried out using qualitative and quantitative methodologies, according to the instrument used, to assess and to evaluate the integration of the Lean Thinking Principles on the Organizational Culture.

6.1 Case study characterization

The case study selected was one of the organizations that participated on the questionnaire BDILCO (case study 5 of section 4.1). After this, the author of this thesis invited the board member to be part of the research allowing his organization to become the case study.

For a better understanding of the organization, Table 20 presents a summary of the various aspects that characterize it. The aspects are: sector of activity; type of product; national or multinational company; main markets; percentage of domestic market; size; annual turnover; total number of employees; and average age.

Table 20 - Company characterization

Aspects	Organization
Activity sector	Construction/Renewable Energy
Product Type	Various
Multinational enterprise	Yes
Main Markets	Europe/South America
Nacional Market (%)	15%
Turnover (annual) 2020	110.521.056,90 €
Number of employees	+/- 500
Number of employees (Budgeting)	12
Average age (Budgeting)	32

After the organization having accepted the challenge, a first contact with a board member of this organization was established. This first contact was made via a two-hour videoconference. During these two hours contact, the proponent of this thesis exhibited to the board member the following points:

- The ILTOC model;
- Summarize the steps to implement the ILTOC model;
- Propose the selection of a pilot area (one value stream).

As the first questionnaire was made on Budgeting area (section 4.1.), the Board member requested a few days to decide if the case study should be on the same area or another. After a week, the board member confirmed that the case study could be on Budgeting area. At the same time, the board member

gave the email of the Budgeting area responsible for a direct contact. One week later, a meeting was scheduled where it was explained the goal of the thesis and the same points presented to the board member. At the end of the meeting, a visit to the office where the team of Budgeting works (the place where they add value) was requested. The goal of this meeting was to align the schedule for the case study development (Table 21).

Table 21 - Case study schedule

Phase	Steps	2021 Week													
		19	20	21	22	23	24	25	26	30	31	32	34	37	40
Phase 1: Train the team	1. Basic concepts	x													
	2. Process fundamentals		x												
	3. Problem solving tools			x											
Phase 2: Identify the three levels of Organizational Culture	1. Artifacts - Language - Technology				x										
	2. Values - Ideals & Goals				x										
	3. Underlying Assumptions - Quantify the cultural traits - Identify the dominant culture profile					x	x	x	x						
Phase 3: Identify the Lean Principles in each Value Stream	1. Value - Value from customer perspective									x					
	2. Value Stream - Identify all the steps in the value stream.										x				
	3. Flow - Assure smooth product/service flow towards the customer											x			
	4. Pull - Produce exactly what is necessary (Right product, Right quantity, Right time)											x			
	5.Perfection - Pursuit waste elimination - Have continuous improvement												x		
Phase 4: Select a Value Stream and define actions	1. Increase the Value of the cultural traits of the organization aligned with the Lean Principles													x	
	2. Apply the 4P model to support the last step														x
	3. Lead teams to the most appropriate profiles to implement Lean Thinking														
Phase 5: Integrate Lean Principles into Organizational Culture	1. Apply the steps of the three previous phases in all Value Streams of the company														
	2. Build a process of continuous improvement														

6.2 Implementing ILTOC

This Budgeting area consists of three business areas: Solar, Power & Grid and Wind Base Of Plant (BOP).

The Table 22 characterizes the thirteen interviewees of Budgeting area that work in this area.

Table 22 - Interviewees' characterization of the Budgeting area

ID	Age	Gender	Years with organization	Area	Training / Professional career
A	39	Male	3	Solar	Electrical Engineer. Responsible for budgets. Experience in commissioning of sub-stations, O&M of wind farms, management of maintenance teams, management of factory production teams.
B	40	Female	4	Solar	Civil Eng. Responsible for the SOLAR business area in the R&D department. Experience in building solar parks
C	32	Male	4	Solar	Electrical Engineer. Responsible for budgets and SOLAR projects. Experience in the manufacture of MV cables.
D	31	Male	2	Solar	Electrical Engineer. Responsible for budgets and SOLAR projects. Experience in Tender of Sub-stations.
E	27	Male	2	Solar	Electrical Engineer. Responsible for budgets and SOLAR projects. Experience in Tender of Solar projects.
F	31	Male	10	Wind BOP	Civil Engineer. Responsible for the WIND business area in the R&D department. Experience in topography.
G	32	Female	4	Wind BOP	Civil Engineer. Responsible for budgets and WIND projects. Experience in roads.
H	28	Female	1	Wind BOP	Civil Engineer. Responsible for budgets and WIND projects. Experience in Geotechnics.
I	29	Female	3	Wind BOP	Civil Engineer. Responsible for budgets and WIND projects. Experience in foundation engineering.
J	29	Male	4	Power & Grid	Electrical Engineer. Responsible for the P&G business area in the R&D department. Experience in wind turbine commissioning
K	38	Male	3	Power & Grid	Electrical Engineer. Responsible for budgets and P&G projects. Experience in MV grid engineering, solar parks and offshore oil rigs.
L	29	Male	1,5	Power & Grid	Electrical Engineer. Responsible for budgets and P&G projects.
M	36	Male	2	Power & Grid	Electrical Engineer. Responsible for budgets and P&G projects. Experience in commissioning of sub-stations, O&M of wind farms, management of maintenance teams, management of factory production teams.

As agreed with the responsible of the Budgeting area, this case study was applied only in one business area: Solar area. It was suggested to the responsible of the Budgeting area to apply the phase 1 of the ILTOC model to all members and the other phases should be applied only on Solar area and he agreed. The characterization of the four employees of the Solar area that were interviewed is presented in the first four lines of Table 22 (grey lines), above.

6.2.1 Phase 1 - Train the “Solar” team

To implement this phase, the contents of the training modules (Appendix 2) were prepared considering the existing bibliography and the 25 years of experience of the proponent of this thesis. This experience

showed that is not enough give training about Lean tools to get results, if those being trained do not have knowledge about the bases:

- Lean concepts;
- Process fundamentals;
- Problem solving tools.

To address this gap, a three-day training of 2,5 hours per day was organized, with the support of the responsible of the Budgeting area. The schedule of this training is presented in Table 23.

Table 23 - Training schedule

		2021 Week		
Phase	Steps	19	20	21
Phase 1. Train the team	1. Basic concepts	x		
	2. Process fundamentals		x	
	3. Problem solving tools			x

Due to the pandemic situation COVID-19, the training on “Basic concepts” was face-to-face to 25% of the team and, at the same time, remotely to the remaining 75% (via video conference). The training on “Process fundamentals” was developed in the same conditions. The training on “Problem solving tools” was face-to-face to 100% of the team. All training included a practical example of the theory learned. During the practical application of the training on “Problem solving tools”, where was applied the knowledge learned (that was made physically with all the Budgeting team), it was realized that the team remotely trained, had more difficulties to apply the knowledge learned.

6.2.2 Phase 2 - Identify the three levels of Organizational Culture of “Solar” team

The purpose of this phase was deciphering the culture of this organization. As referred in section 5.2.3. this phase was composed by three parts related with the organizational culture levels of Schein (2004). The progress through the description of each level, reflects the degree to which the cultural phenomenon is less visible to the observer. On the first level, the Artifacts level, the proponent of this thesis made his interpretation of the categories defined in Table 24.

In parallel it was made the quantification of the actual state related to:

- Number of workers;
- Percentage of hours stayed in Organization after time defined;
- Percentage of absenteeism;
- The different goals defined of the value stream to be analyzed and percentage of achievement;

- The key vectors (KPI's), in the value stream to be analyzed: 1) Quality; 2) Cost; 3) Delivery; 4) Safety and 5) Moral.

Table 24 - Artifact's categories

Artefact	Checked	Examples
Architecture of its physical environment	X	Open spaces
Language	X	Informal
Technology and products	X	State of art
Artistic creations	-	Non existent
Style	X	Informal
As embodied in clothing	X	Casual clothing
Manners of address	X	Normal
Emotional displays	X	Friendly environment
Myths and stories told about the organization	X	People talk about the last Christmas (memories), good clients they have won, projects in adverse locations
Published lists of values	X	Mission, vision and organization values are exposed in all areas
Observable rituals and ceremonies	X	Organization dinners, celebrate birthdays

The Table 25 presents the results of the quantification of the actual state of the Solar value stream related to the KIP defined.

Table 25 - Current state of KPI

Solar Value Stream - KPI	Value
Number of workers	5
Percentage of hours stayed in organization after time defined	20%
Percentage of absenteeism	1%
Project awarded / Won	48 MI
Quality	-
Cost	-
Delivery	97%
Safety	-
Moral	-

When the KPI was measured, this organization did not quantify the key directional vectors: quality, cost, safety, and morale, just the delivery.

On the second level, that is the Espoused Values level, is where are defined espoused goals, ideals, norms, standards, moral principles, and other untestable premises. For this case study, a description of the mission, vision and values of this organization are presented in the Appendix 5. Despite the organization has defined and displayed the Mission, the Vision, and the Values for all employees, when the proponent of this thesis asks if they know it and how they can apply it in their daily work, the answer was "I'm not aware of it".

About the Underlying Assumptions level, the third level, Schein (1988) referred "It is only if we dig beneath the surface of the values by carefully observing the behavior, noting anomalies, inconsistencies or phenomena that remain unexplained and that we evoke in the insiders their underlying assumptions". To

obtain the information that was needed to identify the underlying assumptions of Solar team, the BDILCO was used.

The first part of the questionnaire was the characterization of the Solar team, already presented in Table 22. The second part was the application of the Denison and Neale model. The Figure 60 shows the scores of the Solar Team for the Denison model.

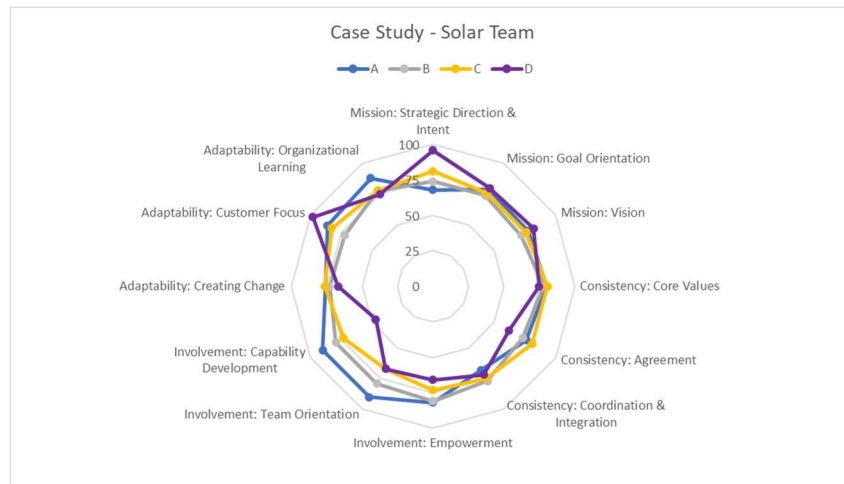


Figure 60 - Results of interviews on Solar Team

The Solar Team mean scores were: on Mission dimension 75%, on Consistency dimension 76%, on Involvement dimension 79% and on Adaptability dimension 79%. The trait best evaluated was Customer Focus with 98% and the worst trait evaluated was Capability Development with 47%. The results of Solar Team show favorable conditions for a good acceptance to implement Lean.

The third part implied the application of the Cameron and Quinn Model (2006), as referred in section 3.2.2.1. The Figure 61 shows the profiles for OCAI individual items related to the Solar Team.

For respondent A (blue color), the dominant culture type on the Dominant Characteristics profile is the Clan, Market and Adhocracy culture, with the score of 30%, on the Organizational Leadership profile is Hierarchy and Adhocracy, with the score of 35%, on Management of Employees profile is Clan, with the score of 40%, on Organizational Glue profile is Clan, with the score of 40%, on Strategic Emphases profile is Clan, Hierarchical, Market and Adhocracy with the score of 25%, on Criteria of Success is Clan and Hierarchy, with the score of 40%. The results of the dominant culture of each profile for individual items are congruent (five out of six are congruent).

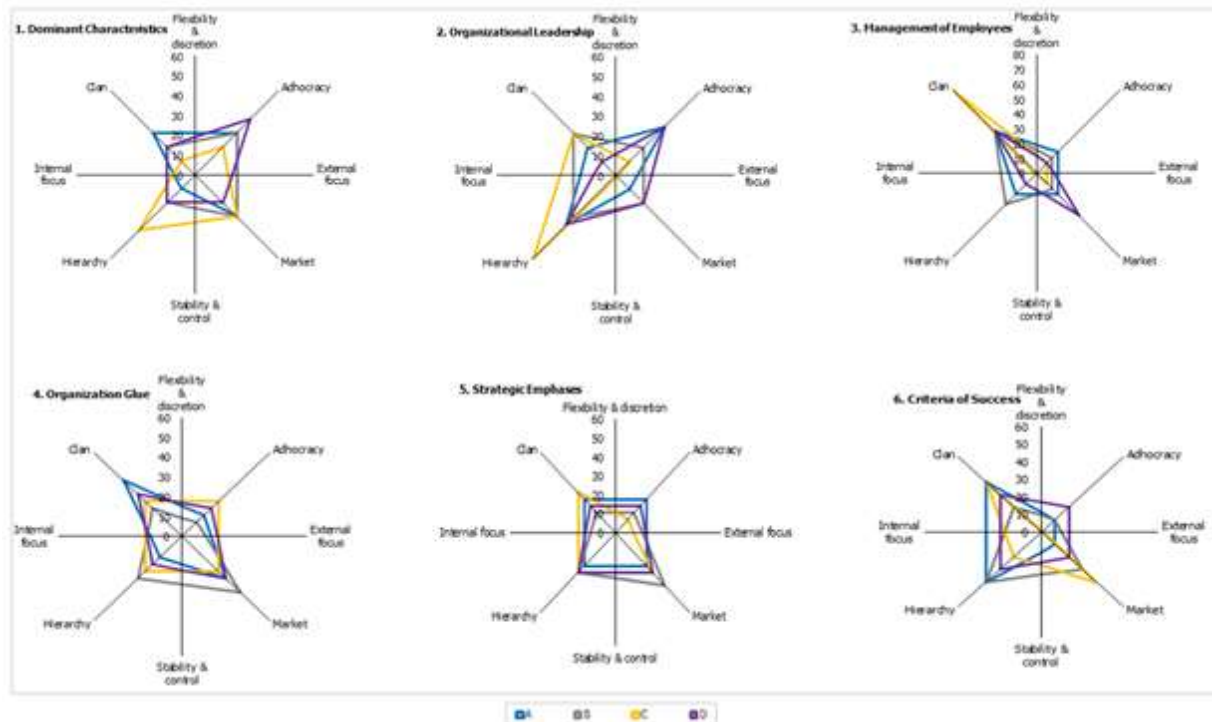


Figure 61 - Profiles for individual items related to Solar Team

The aggregated results will be discussed below, after all individuals' profiles analysis.

For respondent B (grey color), the dominant culture type on the Dominant Characteristics profile is the Market and Adhocracy culture, with the score of 30%, on the Organizational Leadership profile is Hierarchy, with the score of 60%, on Management of Employees profile is Clan, with the score of 80%, on Organizational Glue profile is Market, with the score of 40%, on Strategic Emphases profile is Market with the score of 40%, on Criteria of Success is Hierarchy, with the score of 40%. Results of the dominant culture of each profile for individual items are not congruent.

For respondent C (yellow color), the dominant culture type on the Dominant Characteristics profile is the Hierarchy culture, with the score of 40%, on the Organizational Leadership profile is Hierarchy, with the score of 60%, on Management of Employees profile is Hierarchy, with the score of 50%, on Organizational Glue profile is Clan, Hierarchical, Market and Adhocracy with the score of 25%, on Strategic Emphases profile is Clan, Hierarchy and Market with the score of 30%, on Criteria of Success is Clan and Market, with the score of 40%. Results of the dominant culture of each profile for individual items shows some congruence (four out of six are congruent).

For respondent D (purple color), the dominant culture type on the Dominant Characteristics profile is the Adhocracy culture, with the score of 40%, on the Organizational Leadership profile is Hierarchy and Adhocracy, with the score of 40%, on Management of Employees profile is Clan and Market, with the score of 40%, on Organizational Glue profile is Clan and Market with the score of 35%, on Strategic

Emphases profile is Hierarchy and Market with the score of 30%, on Criteria of Success is Clan and Hierarchy, with the score of 30%. Results of the dominant culture of each profile for individual items are not congruent.

The Figure 62 shows the aggregated results of the individual items related to the cultural profile of the Solar Team.

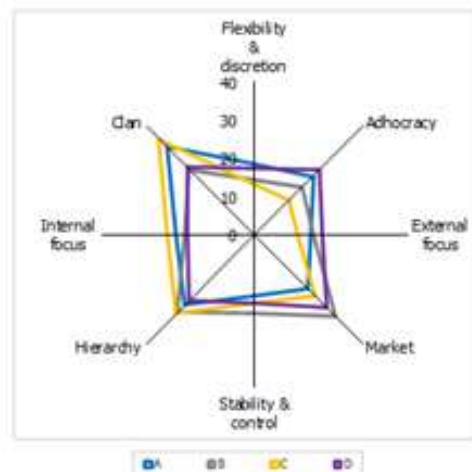


Figure 62 - Individual items combined profile of Solar Team

The dominant culture is the Clan for the respondent A, with the score of 32%. For the respondents B and D the dominant culture profile is Market, with the score of 30% and 27% respectively, with a similar pattern. For the respondent C the dominant culture profile is Hierarchy, with the score of 29%. However, this similarity does not mean respondents act in the same way. The Table 26 shows alignment between members of this team at the organization level but revealed, at the individual level, a situation of congruence for respondent A, a situation of some congruence for respondent C and a situation of no congruence for respondents B and D.

Table 26 - CVF results synthesis of Solar team

Respondents	Individual	Organization
A	C	C
B	NC	
C	SC	
D	NC	

C - Congruent; SC - Some congruence; NC - Not congruent

6.2.3 Phase 3 - In the selected value stream identify the Lean Principles for the “Solar” team

This phase 3 is made up of five steps, where each part is the application of one Lean Thinking principle, as seen in the section 5.2.3. The first step was to identify/document the value of the value stream selected. To identify this value, the Solar team has gathered with the Commercial area to identify the

value from the customer perspective. They discussed the final customer expectations, by identifying the form, feature, or function that the customer is willing to pay for. The first awareness was that Commercial area did not have knowledge about this concept. One member of the Solar team gave training to the Commercial Team about his concept. The knowledge of the Commercial about value allowed the identification of small details in some customers orders that in the past passed by. With the value well defined, the Solar team defined the objective for each action surround to delivery this value.

The second step was to identify all the steps (actions) in the value stream to supply the value defined. In this part, the Solar team checked the actual process they have institutionalized. It was noticed that the actual process description was not updated and did not help the team to identify the relation between the other teams and between the processes. Also, there was not found summarized information about expected inputs and outputs in each task of the process.

To solve this situation, the Solar Team was involved in several meetings to clearly analyze the value they need to supply in each part of the process. It was proposed to map the actual process with the methodology they learned in the previous training session ("Process fundamentals"). During this, the Solar team applied all the concepts they learned on the first training session about Value and type of Wastes ("Basic Concepts"). To make a good analysis of the potential opportunities and focus on the root cause, the Solar team applied the knowledge learned on the third training session ("Problem Solving Tools"). The integration of this knowledge allowed the Solar team to develop a process description with the information needed to confirm the supply of the value that the customer was expecting (learned on the second training session).

The third step was to identify in each part of the process if the work was continuous (start and finish without interruptions). Here the Solar team checked in each task if they stop, during the process. The Solar team identified several stops during the tasks they did. After this identification, the team applied the tools learned on the second training session, to eliminate all these stops. The Solar team try to reduce the time between the stoppages of the work when it was not possible to eliminate it.

The process of the Solar team is composed of 55 activities. For 11 of these, the inputs came from other areas (Commercial, Engineering and Procurement) throughout the process. Usually, the information that comes from these departments either does not arrive on the date set or comes incomplete. In order to do not stop their work, the team pick another task for which it has data that is not in sequence of the process, and when the requested input arrived, they interrupt the task they are working and carry out the unfinished task. Unfortunately, this is a recurrent situation, and to be able to meet the deadline for the

submission of the project proposal, normally the team stay every day more two hours after their normal working time.

To minimize this situation and apply the knowledge acquired in the training session (Lean concepts, Process fundamentals, Problem solving tools), the Solar team involved the other departments which interact to jointly increase the process flow. This is an ongoing work because as both parties gain maturity in these concepts more opportunities arise to increase the flow of the process.

The fourth step was to implement the pull. Once all the employees that participate in this value stream were engaged with the first three principles, pull principle was the next important aspect of Lean Thinking, to ensure customers' (internal) receive their desired information when they want it to supply the final information to external customer when they want it. To apply that, it was important ensure that customers receive their desired information when they want it. Here the Solar Team identified all the triggers between all the processes of the value stream to only do what is necessary, when it is necessary. One important aspect to consider in this step was to have all the tasks (activities) with lead time defined (made on step 2). Without this lead time definition, it would be very difficult to implement the pull system.

The fifth step was to implement the continuous improvement. Here the Solar team used the daily morning Kaizen meeting (total time of 15 minutes and adapted from the original referred in section 5.2.3 to pull the value that the team defined, Appendix 6) they already had, to pull up opportunities they found in the day before, with the goal of continuously identify and eliminate activities that were considered waste and focus on activities that truly created value. These opportunities were pulled by the learning they had in the first training session. In this step, the Solar team started to do the first steps to create the process of continuous improvement (Phase 5).

6.2.4 Phase 4 - In the Value Stream selected define actions for the Solar Team

This phase 4, is made up of three steps, as described in section 5.2.4. These are described next.

6.2.4.1 First step - Increase the Value of the cultural traits of the organization aligned with the Lean Principles

The first step is Increase the Value of the cultural traits of the organization aligned with the Lean Principles. The scores of the BDILCO instrument related with the openness to the organization implement Lean Thinking (second part of the BDILCO instrument (Denison and Neale model)) shows that the Solar team have openness to implement Lean. Table 27 presents the medium scores of the second part BDILCO instrument. All the scores between 50% and 74% have a yellow color.

Table 27 - Medium scores of the second part of BDILCO

Dimension	Respondents			
	A	B	C	D
Mission	75%	78%	86%	73%
Consistency	75%	79%	70%	76%
Involvement	87%	71%	60%	80%
Adaptability	83%	79%	80%	74%

Although being above 50%, the score of respondent C related to Involvement dimension is quite low: 60%. To understand better this and the other scores, it was analyzed the scores of each index of the second part BDILCO instrument (Figure 63, Figure 64, Figure 65 and Figure 66). A red line in each figure represents the score of 75%. All the scores under this value must be analyzed. For this, it was organized a meeting with all respondents simultaneously where all can speak freely and support each other. During the meeting the scores of each answer were shown to all respondents. The respondent C explained to the team why he gave this evaluation. In this meeting, the responsible of Solar team also participate. He was one of the respondents and want to understand what was missing and want to promote actions that will be needed. All the scores under 75% were questioned. All the answers were registered, and actions were defined to increase the score of each question (theme), explained next.

Related to the mission dimension, and from the Figure 63, it is possible to see that respondent A and D had scores under 75% and the reasons need to be analyzed to promote actions in order to increase these scores. For the respondent A, a strategic direction and intent needs to be clarified and in the case of respondent D needs too a strategic direction and intent clarification, plus the goal orientation and vision. It is suggested to promote meetings and workshops where this could be discussed.

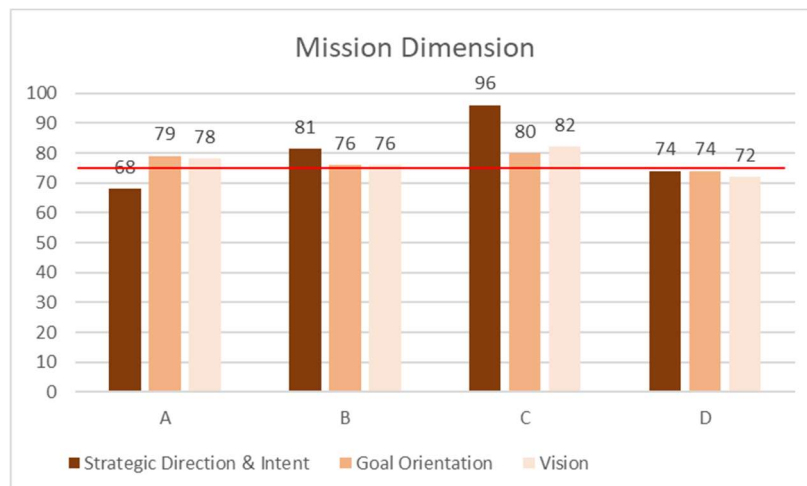


Figure 63 – Medium scores of each index of the second part BDILCO instrument – Mission

The consistency dimension (Figure 64) for respondent A, respondent C and respondent D demanded an analysis to find adequate actions to increase scores of the coordination and integration for the respondent A, the agreement and also coordination and integration for the respondent C and agreement for

respondent D. To increase the scores of coordination and integration for respondent A and C it was suggested to develop actions to understand in what functions and units of the organization they have more difficulties in order to achieve common goals and work together to improve this relationship. To increase the scores of agreements for respondent C and D, it was suggested that everyone should also consider the others' perspective to achieve a "win-win" solution.

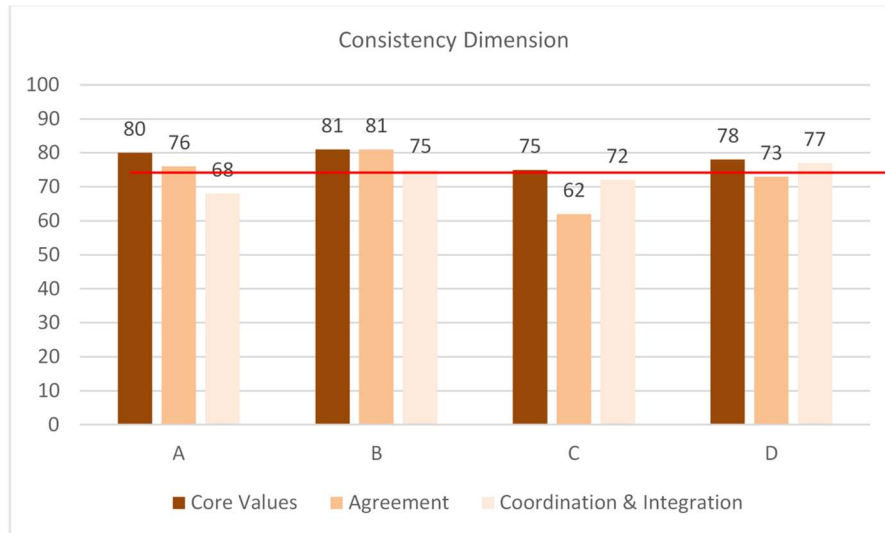


Figure 64 - Medium scores of each index of the second part BDILCO instrument – Consistency

Related to the involvement dimension (Figure 65), it is possible to see that respondent B and C had scores under 75% in all items. This information requires more attention because this means that respondent B and C are less involved comparing with respondent A e D. It was in this dimension that a score lower than 50% occurred, that was the capability development with the score of 47%. Organization needs to ack quickly to understand the reasons of this low score with respondent C to promote adequate actions to increase this score. In this case, it was proposed training for respondent C.

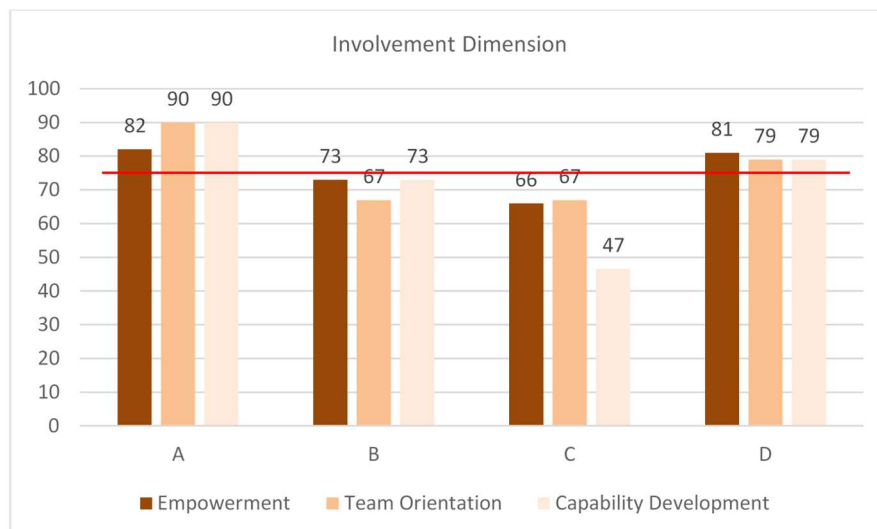


Figure 65 - Medium scores of each index of the second part BDILCO instrument – Involvement

The adaptability dimension (Figure 66) for respondent C and respondent D demanded an analysis to find adequate actions to increase the creating change (like improve way of work, understand better the need to change), an analysis to find adequate actions to increase the customer focus (e.g. understand better the needs of the internal customer and external customer).

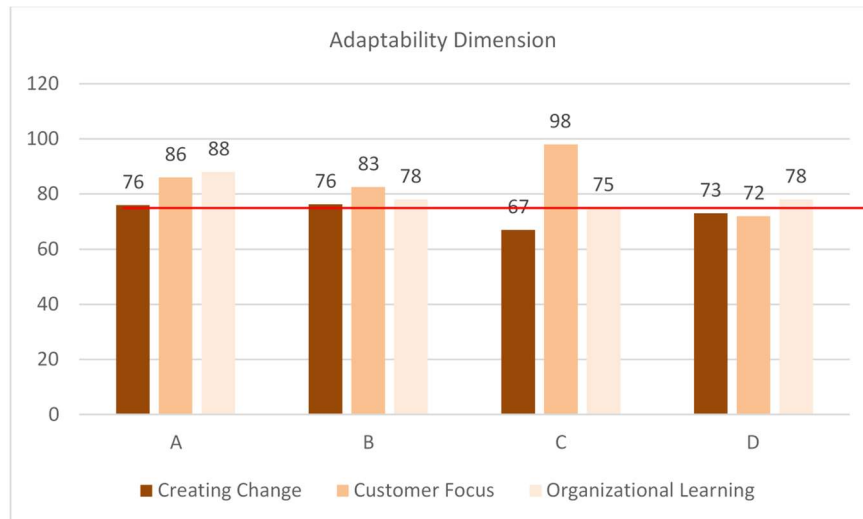


Figure 66 - Medium scores of each index of the second part BDILCO instrument - Adaptability

The organization opted do not directly push more on the scores above 75%. As in general the scores were good, no more actions were taken related with the openness to implement Lean Thinking.

The third part of the BDILCO instrument (Competing Values Framework) was applied and results were obtained. During the application of the questionnaires to the Solar team, it was explained the meaning of each type of culture and its advantages to the board member of this organization. It was used the description of the section 2.1.1.3. Then, it was decided the intended type of organizational culture for the Solar team. The decision was to align the Solar team with a balance culture (Clan with 25%, Hierarchical with 25%, Market with 25% and Adhocracy with 25%), as it seems the most adequate to answer to the market they work and the goals of the organization.

With this information and the analysis of the results of the third part of the questionnaire, the next step was to align the Solar team to a congruent balanced predominant organizational culture. Thus, another meeting was organized to show to the Solar team these results, each individual profile at each time, with the scores of each respondent. The scores obtained were registered in a table and all scores under 20% or above 30% were marked with a yellow color or a red color if these values are “outliers”, for instance “0” or for the interval 60%-100%. For all the scores marked with the yellow color, no concrete actions were defined because the responsible of the Solar team opted in this phase of learning it will be too many actions to define and to apply, that will be complicate to concretize and then make the follow up. The option was to define actions only to the scores marked with red color.

For the profile item “Dominant characteristics” in the Table 28 the red color was not marked, just the yellow, so no actions were developed. The respondent B is aligned with the balance culture. The other respondents need some clarification on in which areas they must change behaviors, for example respondent D must reduce a little the spirit of risk-taking, delivering exactly what was defined with the customer.

Table 28 - Scores for the profile item Dominant Characteristics

Dominant Characteristics				
Culture Type	Respondents			
	A	B	C	D
Adhocracy	30	30	20	40
Market	30	30	30	20
Hierarchy	10	20	40	20
Clan	30	20	10	20

Table 29 show the results for the profile “Organizational Leadership” and two cells are marked with red color. The actions needed to balance the scores marked with the red color are described in the Table 30.

Table 29 - Scores for the profile item Organizational Leadership

Organizational Leadership				
Culture Type	Respondents			
	A	B	C	D
Adhocracy	35	20	10	35
Market	10	20	0	20
Hierarchy	35	30	60	35
Clan	20	30	30	10

Table 30 - Actions needed to increase the scores of Organizational Leadership

Actions to be developed - Organizational Leadership	
Market Culture	Hierarchical Culture
What do I should start doing or do more of?	What do I stop doing or do less of?
Pushing more toward the objectives, implement actions to promote continuous improvement.	Stop controlling every aspect and start delegating and hold technicians accountable.

Table 31 show the results for the profile “Management of Employees” and two cells are marked with red color. The actions needed to balance the scores marked with the red color are described in the Table 32.

Table 31 - Scores for the profile item Management of Employees

Management of Employees				
Culture Type	Respondents			
	A	B	C	D
Adhocracy	15	20	10	10
Market	15	20	10	40
Hierarchy	30	20	0	10
Clan	40	40	80	40

Table 32 - Actions needed to increase the scores of Management of Employees

Actions to be developed - Management of Employees	
Hierarchical Culture	Clan Culture
What do I should start doing or do more of?	What do I stop doing or do less of?
Give the team more vision of the future in terms of career.	Stop asking for consensus and giving further guidance.

For the profile item “Organization Glue” in the Table 33 just the yellow color was used, that means no actions were developed. The respondent C and D are aligned with the balance culture. The other respondents need some clarification on in which areas they must change behaviors, for example

respondent B must lightly reduce the focus on aggressive positioning in the market because this could be pernicious, by ignoring other important aspects.

Table 33 - Scores for the profile item Organizational Glue

Organization Glue				
Culture Type	Respondents			
	A	B	C	D
Adhocracy	15	10	25	20
Market	30	40	25	30
Hierarchy	15	30	25	20
Clan	40	20	25	30

The red color did not appear in the profile item “Strategic Emphases” in the Table 34, meaning that no actions were necessary. The respondent A and D are aligned with the balance culture. The other respondents need some clarification on in which areas they must change behaviors, for example respondent C must increase innovation, creativity, and the willingness to face new challenges.

Table 34 - Scores for the profile item Strategic Emphases

Strategic Emphases				
Culture Type	Respondents			
	A	B	C	D
Adhocracy	25	15	10	20
Market	25	40	30	30
Hierarchy	25	30	30	30
Clan	25	15	30	20

Table 35 show the results for the profile “Criteria of Success” and one cell is marked with red color. The actions needed to increase the scores marked are described in the Table 36.

Table 35 - Scores for the profile item Criteria of Success

Criteria of Success				
Culture Type	Respondents			
	A	B	C	D
Adhocracy	10	10	0	20
Market	10	30	40	20
Hierarchy	40	40	20	30
Clan	40	20	40	30

Table 36 - Actions needed to increase the scores of Criteria of Success

Actions to be develop - Criteria of Success
Adhocracy Culture
What do I should start doing or do more of?
Start driving innovation in our line of work.

6.2.4.2 Second step - Apply the 4P model to support the actions

The second step is to apply the 4P model to support the actions made or schedule to made in the first part and increase the alignment with the purpose to the Lean Principles be cultural. To apply the 4P model, another meeting was made to explain to Solar team what is the 4P model and how this model helps in supporting all the work made until the moment and highlight some points that can be unexploited

because of the lack of knowledge. Thus, during this meeting was made an explanation about each principle of each level of the 4P model, to guarantee in the future that it would be applied in the value stream selected.

It was conducted a meeting to analyze and identify the gaps referred in the section 5.2.4. but, unfortunately, it was not possible to implement actions due to unpredictable events. Attending to the gaps identified, the next step could be applying the Problem-Solving tool.

6.2.4.3 Third step - Lead teams to the most appropriate profiles to implement Lean Thinking

The third step was to lead teams to the most appropriate profiles to implement Lean Thinking. At this point, the Solar Team had already gained some maturity about Lean Thinking and the next step would be to adapt the leadership management in Lean Thinking Culture that they were transforming. To achieve that, another meeting would be to organize a new training session to develop new capabilities on the leaders of Solar team. The idea was to involve two leaders: the Supervisor of the Budgeting area and the Team leader of the Solar team and follow the points described in section 5.2.4.

6.2.5 Phase 5 - Integrate Lean Principles into Organizational Culture of the Solar team

This phase 5 is made up of two steps. The first step is to apply the steps of the three previous phases in all Value Streams of the company. This step was not applied in this case study due to time constraints.

The second step is to build a process of Continuous Improvement. The main goal of this step was that all workers of Solar team made improvements as daily habit. Before start to build the process of Continuous Improvement, the questions raised in the section 5.2.5 should be asked to the Solar team.

These questions should pull the team to think what they need to do differently to naturally have continuous improvement. To be continuous, must be in a daily basis, and to be in a daily basis it is needed to create space for that or use adequately that space if already exists.

This organization had a daily meeting (15 minutes – daily Kaizen), but it was not using adequately this time, because they did not have a process for continuous improvement. With the starting of the implementation of this case study, the Solar team pull the Budget team to use more adequately the daily meetings. During the case study implementation, the Solar team confided that their work was improving in result of the way they started doing the daily meetings.

6.3 Discussion

The implementation of Lean Thinking in an organization is not always an easy and peaceful process, due to the characteristics related to each organization and in which areas it is implemented, and all organizations react differently to change.

In the area where was developed the case study, since the first minute, all team revealed openness to learn and apply all the themes learned. This openness helped to overcome all the barriers that appeared during this journey. Like in an office area, the proponent of this thesis has to be more careful to explain and to support the implementation of the ILTOC model in this case study. The KPI evolution during the ILTOC implementation in the case study is presented in Table 37.

Table 37 - KPI evolution since WK 19 until WK 48 of the Solar value stream

Solar Value Stream - KPI	Value	
	WK - 19	WK - 48
Number of workers	5	4
Percentage of hours stayed in organization after time defined	20%	20%
Percentage of absenteeism	1%	1%
Project awarded/won	48 MI	127 MI
Quality	-	90%
Cost	-	<5%
Delivery	97%	99%
Safety	-	-
Moral	-	-

It is possible to see that the number of people on the team decreased in one collaborator, nevertheless, the team achieved to improve the key directional vector delivery by 2.1%. Also, the ratio of the project awarded/won increased 165%, even with the same percentage of hours stayed in organization after time schedule and maintaining the percentage of absenteeism in 1%.

Since the training, the Solar team started to look to the existing KPI in a different way as something that they can directly influence. Nevertheless, KPI such as strategic market to achieve, cannot be directly influenced by the low-level collaborators. For more engagement of the collaborators, the KPI must be defined in a way that they recognize as being aligned with their own work. When the team was rewriting their process, they started to quantify all activities of the Solar team related to quantification of the key directional vectors: quality, cost, delivery. In the end of week 48 the Solar team achieved the values presented in Table 37. The safety and morale vectors were not analyzed because they decided to get maturity on the first three vectors and then start to quantify safety and moral.

In this case study, it was possible to implement the phase 1, 2, 3 and the first step of phase 4. Regarding steps 2 and 3, in spite of not being implemented, an overview of all 14 principles of the 4P model (step 2) was presented to the responsible of the Solar team to prepare this implementation. During this overview, it was compared the actual condition with the desired condition. After this exposition, the responsible of the Solar team has gained awareness about the gap in each principle of the 4P model. This overview would allow an effective implementation of these two steps. Also, the steps 1 and 2 of phase 5 were not applied. Note that the step 2 of phase 5 was partly implemented in consequence of the methodology implemented on the fifth step of phase 3 that was related to implementation of continuous improvement. Nevertheless, there is a commitment with the organization to conclude the implementation of the model later on.

During the implementation of this case study, it was highlighted that, in spite of all team members were open to change, the change transformation did not happen overnight. It was being achieved slowly, being pulled by the building process of continuous improvement and by the proponent of this thesis in all the meetings he had with the Solar team. This is a continues working on the change because the team did not finish the implementation of all phases and steps of this model.

Like a cultural transformation the implementation of this model needs time. The timeline for each phase of this model was not discussed because all organizations are different, and several factors influence the path to implement each phase and the cultural transformation of the organization. When the team and the organization are aligned, some tools can be used to support the cultural transformation. One tool is, for example, the Toyota Kata that is a set of daily routines towards continuous improvement (Rother, 2010).

The ILTOC model should be implemented from bottom-up, i.e. hierarchical low-levels, contrary to some models top-down like the Hoshin-Kanri approach that starts with the strategic levels and deploy the objectives to the hierarchical low-levels. According to Silveira et al. (2018) the Hoshin-Kanri is a strategic management framework relied in Total Quality Management (TQM) having underneath the PDCA methodology. This involves a repeated process that are cascaded downwards in the organizational structure, they take the form of a balanced set of objectives. This set of objectives are supported in the following dimensions: quality, cost, delivery and education/employee (QCDE) (Giordani da Silveira et al., 2018). The ILTOC model goes beyond that by considering safety and moral, as represented in the TPS house. In this way, independently of the dimension considered, the work conditions must always be assured.

The Hoshin-Kanri is also considered as the natural evolution of the management by objectives approach, introduced by Peter Drucker in the beginning of the 1950s (Silveira et al., 2018). However, this approach could be pernicious as is focused on the ends and not in the means. Once more, the ILTOC model is different because it is always focused on the team and its growth. There is a close tutoring of the team, where each one acts like a coach, like in the TPS culture (Spear & Bowen, 1999). The team will naturally behave in order to develop actions to deliver value to the clients.

Although being developed having in mind the Portuguese context, this model could be applied to different countries, as the actions developed are independent of any national culture. It is always important to deliver value to the customers, to have flow, to pursue perfection in order to attend the key objectives: cost, quality, delivery, safety and moral.

7. CONCLUSION

This chapter presents the final considerations and research limitations. These are followed by the main contributions and the answers to the research questions of this thesis. Finally, some suggestions for future work are proposed.

7.1 Final considerations and limitations

The motivation for this thesis emerged from the professional experience of the author as a manager in various areas of an organization (office and shop floor). The author felt a need to understand how the teams could deliver more value to the final customer and to the organization. Lean Thinking, based on Toyota model, is an organizational philosophy that proved to be capable to deliver this value. Although there were some models to implement Lean Thinking, they were not applicable to the whole organization, i.e., office and shop-floor, and, sometimes, when applied did not achieved the full results expected.

Each organization choose the methodology more adequate for its context to implement Lean Thinking and constantly invest money in training and consultants to leverage the value supplied. Often the return on this investment on this theme is less than expected. In result of this reality, the goal was to understand what was missing to apply the example of Toyota to all kind of organizations.

For the proponent of this thesis, the trigger for this truly application of the Lean Thinking is the Organizational Culture, as the way people work impacts on the value added delivered to organization and, lastly, to the final customer. To achieve this, it was explored the interconnection between Lean Thinking principles, Organizational Culture and Toyota Way.

The literature review helped to select the Organizational Culture model to make this interconnection that was the Schein model. The experience of the proponent of this thesis in Lean Thinking and the knowledge about Toyota pushed the need to develop a model that considered the Lean principles part of the Organizational Culture. The model developed was named Integration of Lean Thinking into Organizational Culture (ILTOC) model.

To create the ILTOC model, firstly, it was necessary to evaluate the organizational culture related to the openness to implement Lean and the predominant culture type. For this, it was developed a questionnaire named Bi-dimensional instrument for Lean Culture Openness (BDILCO). The questionnaire was composed by three main parts with different purposes: i) Characterization of the respondent and the company; ii) Denison and Neale Model and iii) Cameron and Quinn Model. The first part characterizes all

respondents and the organization. The second part is dedicated to survey the organizational culture in relation to four dimensions adapted from Denison and Neale (1999) to identify the openness level to Lean Thinking. The third part is dedicated to survey the Organizational Culture in relation to six assessment items adapted from Cameron and Quinn (2011) in order to identify the Organizational Culture predominant type. This questionnaire was applied in five organizations planted in Portugal, four domestic capital organizations and one foreign-owned organization. Three of them already implemented Lean (case study 2, case study 3, case study 4), the other had been trying.

The knowledge gained during the application of the BDILCO questionnaire and the literature review, supported the development of the ILTOC model. The three-dimensional ILTOC model is constituted by five phases: i) Train the team which purpose is to teach the Lean fundamentals and processes concepts; ii) Identify the three levels of Organizational Culture in order to understand the Artifacts, Values and Underlying assumptions for each organization and quantify the current state for the start-up of the integration of the Lean Thinking; iii) In the value stream selected identify the Lean Thinking principles to recognize the value and the moment to deliver this value; iv) In the value stream selected define actions to increase the value of the cultural traits of the organization aligned with the Lean Thinking principles by applying the 4P model and lead teams to the most appropriate profiles; v) Integrate Lean Thinking principles into Organizational Culture by applying the steps of the three previous phases in all Value Streams of the organization and build a process of Continuous Improvement. With application of these phases, it is expected that people act naturally to get value and results for the organization.

The ILTOC model was partially implemented on a case study, selected during the questionnaire phase. The phases of the ILTOC model implemented were the phase 1, 2, 3 and the first step of phase 4. Due to the lack of availability of the organization it was not possible to implement the steps 2 and 3 of phase 4 and all steps of the phase 5 (steps 1 and 2). Nevertheless, it was possible to get some results, namely, the reduction of number of workers by one, the increase of projects won in 165%, the increase of the delivery rate by 2.1%. Also, they started to quantify key vectors (quality, cost) not previously measured. These values mean that they begin to believe in “doing more with less”.

This thesis is based on the transformation of the Organizational Culture of organizations by integrating the Lean Thinking principles. Normally, each Organizational Culture takes its time to change. It is not easy to set a time for this transformation. The case study was implemented during 29 weeks and, as previously referred, it was not possible to implement all the phases of the ILTOC model. The available time of the organization was a limitation that did not allow to develop and obtain more results than the

ones previously referred and documented on section 6.3. Another limitation is the research strategy used to collect data through the questionnaire (five organizations) and the only one case study to research the viability of the model.

The pandemic situation caused restrictions on the implementation of the ILTOC model because several meetings were performed by video conference, creating distance between the interlocutors, jeopardizing the gathering of some details of the organization's reality. Another restriction was related to the proponent of this thesis availability that develop the work in parallel with his job in the organization he works. This also limited his visits to the organization where the case study was developed. Consequently, the organization data was obtained through the employees that sometimes, were not so fast to answer, as desired. However, because it was a voluntary support (i.e. a consulting contract was not formalized), the proponent of this thesis is grateful for their answers.

7.2 Contributions and answers to the research questions

This thesis contributes to the evolution and dissemination of knowledge on Lean Thinking and Organizational Culture. The integration of these two concepts will result in improvements in performance and, consequently, to the competitiveness of the organizations. This means that it is important to research how they could be interconnected, and their synergies explored. This was the trigger for the research undertaken in this thesis.

Thus, some research questions and sub-questions were raised, and the research developed allowed to answer to them. Related to the first main question:

RQ1: What are the factors that act as enablers and/or inhibitors in the integration of Lean Thinking principles in the culture of Portuguese organizations?

This question was answered through a literature review which main results are presented in section 2.2.3 and was published in Amaro et al. (2020). The factors that act as enablers and/or inhibitors in the integration of Lean Thinking principles are: i) Management support, ii) Culture, iii) Involving employees, iv) Training and v) Commitment. The proponent of this thesis considered that such factors are independent of the country where the organization is located.

To learn more about the strength/influence of the Organizational Culture in this integration one sub question was raised:

sRQ1.1: Is the Organizational Culture an enabler or inhibitor in this integration?

This sub-question was answered in section 2.3, and Organizational Culture could be a facilitator or inhibitor, depending on the company Organizational Culture, as reviewed by Amaro et al. (2020a).

As the majority of the studies are about operations, the proponent of this thesis wanted to learn if the difficulties/opportunities in indirect areas or departments farthest of operation are the same as in the operations and one more sub question was raised:

sRQ1.2: Is it more difficult this integration in the departments farthest of operations?

The answer to this sub-question was given on section 4.2, where was demonstrated that in different organizations, departments farthest of operations have good results to the openness for Lean Thinking. The ILTOC model that was developed in this thesis was applied to a department farthest of operations in the case study studied, the Budgeting area. It was possible to see that this integration happened. Each organization have their own characteristics, and these characteristics will influence the difficulty of the integration of Lean Thinking into Organizational Culture, independently of the area where is being implemented.

To conclude, the ILTOC model supported the integration of Lean Thinking into Organizational Culture, exploring the synergies between such fundamental concepts. By doing this is expected that employees develop a natural behavior and better face new challenges. In a changing world characterized by a volatile, uncertain, complex and ambiguity (VUCA) environment this behavior is more important than before, as seen in recent pandemic situation. Also, having in mind the Society 5.0 concept, people will become the center of all activities: industrial, services, healthcare, among others, by seeking a balance of the economic development, social and the environmental dimensions.

7.3 Future work

As future work, it is intended to continue the follow up in the organization where the case study was implemented to give support on the finalization of the implementation of the ILTOC model. This may indicate the need to research more efficient ways of implementing this model. To contribute for this efficiency, it will be relevant to promote formalized practices that, normally, are just on the heads of the employees.

The BDILCO questionnaire will benefit of an automated mechanism to collect the answers and analyses the results. For the answers collection, it was used PowerPoint and then these results were manually inserted in an Excel file to do the calculations and build the graphs. Attending to the tables and graphs

created (more than 50), as future work it could be an interesting work to transform the BDILCO in a software tool.

In terms of the ILTOC model, more research can be devoted to the development of cultural adaptation actions suited to each organization. In this regard, the definition of actions to improve the results of BDILCO (e.g. Cameron and Quinn model), could be further researched using other approaches.

Another goal is to disseminate the ILTOC model for more organizations (different areas) to confirm that the applicability of the ILTOC model integrate the Lean Thinking principles on the Organizational Culture and delivery value to all stakeholders, increasing the organization's results. As the ILTOC model is independent of the nationality of the culture, it will be interesting to apply the ILTOC model in another country to confirm the achievement of results from that organization. This could indicate more improvement opportunities to refine the model.

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APPENDICES

APPENDIX 1 – PARTS OF ORGANIZATIONAL CULTURE QUESTIONNAIRE (BDILCO)

Table 38 - Characterization of the respondent (part 1)

Aspects	Value
Activity sector	
Kind of product	
Main markets	
Company size	
Turnover (annual)	
Number of employees	
Age	
Educational level	
Role	
Organizational level	
Years in the organization	
Years in office	

Figure 67 - Denison Model (part 2)

As 6 dimensões da parte 2 do questionário são:

1. Características Dominantes;
2. Liderança Organizacional;
3. Gestão dos Colaboradores;
4. "Cola" Organizacional;
5. Ênfase Estratégica;
6. Critérios de Sucesso.

1. Características Dominantes - Características dominantes da organização, ou como a organização é caracterizada no geral.

Características Dominantes	A organização é um lugar muito pessoal: é como uma extensão da família. Os colaboradores parecem partilhar muito de si mesmos.	
	A organização é uma empresa dinâmica e empreendedora. Os colaboradores estão dispostos a "esticar o pescoço" e assumir riscos.	
	A organização é muito orientada aos resultados. Uma importante preocupação está em fazer o trabalho. As pessoas são muito competitivas e orientadas para resultados.	
	A organização é um lugar muito controlado e estruturado. Procedimentos formais geralmente governam o que os colaboradores fazem.	
	Total (100)	0

2. Liderança Organizacional - O estilo e abordagem de liderança inerentes à organização.

Liderança Organizacional	A liderança na organização é geralmente considerada um exemplo de orientação, facilitação ou carinho.	
	A liderança na organização é geralmente considerada um exemplo de empreendedorismo, inovação ou assunção de riscos.	
	A liderança na organização é geralmente considerada um exemplo de absurdo e agressivo foco orientado para resultados.	
	A liderança na organização é geralmente considerada um exemplo de coordenação, organização, ou eficiência de operação.	
	Total	100

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3. Gestão dos Colaboradores - A gestão de colaboradores ou o estilo que caracteriza como os colaboradores são tratados e é caracterizado o ambiente de trabalho.

Gestão dos Colaboradores	O estilo de gestão na organização é caracterizado por trabalho em equipa, consenso e participação.	
	O estilo de gestão na organização é caracterizado pela tomada individual de riscos, inovação, liberdade e singularidade.	
	O estilo de gestão na organização é caracterizado por uma forte competitividade, exigências elevadas e realizações.	
	O estilo de gestão na organização é caracterizado por segurança no emprego, conformidade, previsibilidade e estabilidade nos relacionamentos.	
	Total	100

4. "Cola" Organizacional - A "cola" organizacional ou mecanismos de ligação que mantém a organização junta.

"Cola" Organizacional	A "cola" que mantém a organização unida é a lealdade e confiança mútua. O compromisso leva a organização a um bom desempenho.	
	A "cola" que mantém a organização unida é o compromisso com a inovação e desenvolvimento. Há uma ênfase em estar na vanguarda.	
	A "cola" que mantém a organização unida é a ênfase na conquista e na realização do objetivo.	
	A "cola" que mantém a organização unida são as regras e políticas formais. Manter um bom funcionamento da organização é importante.	
	Total	100

5. Ênfase Estratégica - As ênfases estratégicas que definem quais áreas de ênfase a direcionar na estratégia da organização.

Ênfase Estratégica	A organização enfatiza a capacitação. Alta confiança, abertura e participação persiste.	
	A organização enfatiza a aquisição de novos recursos e criação de novos desafios. Inovar e procurar oportunidades são valorizados.	
	A organização enfatiza ações competitivas e conquista. Atingir alvos e ganhar no mercado são aspetos dominantes.	
	A organização enfatiza a permanência e estabilidade. Eficiência, o controle e a estabilidade das operações são importantes.	
	Total	100

23

6. Critérios de Sucesso - Critérios de sucesso que determinam como a vitória é definida e o que é recompensado e comemorado.

Critérios de Sucesso	A organização define o sucesso com base na capacitação, trabalho em equipa, compromisso dos colaboradores e preocupação com os mesmos.	
	A organização define o sucesso com base em ter produtos exclusivos ou mais novos.	
	A organização define o sucesso baseado em vencer no mercado e ultrapassando a concorrência. Liderança competitiva no mercado é fundamental.	
	A organização define o sucesso com base na eficiência. Entrega fiável, programação estável e produção de baixo custo são críticas.	
	Total	100

24

25

26

27

28

Figure 68 - Cameron & Quinn model (part 3)

APPENDIX 2 – TRAINING MODULES

Lean concepts

<p>Formação Lean Thinking</p> <p>1</p>	<p>O Mercado - Mudança de Paradigmas</p> <p>O funcionamento dos mercados sofreu uma alteração no seu paradigma:</p> <ul style="list-style-type: none"> Qualidade Baixo Custo / Preço Justo Prazos de Entrega Variedade <p>Já não são as empresas a definir o preço. Este é definido pelo CLIENTE.</p> <p>2</p>	<p>O Mercado - Mudança de Paradigmas</p> <p>A única forma de garantir a margem de lucro é fazer uma gestão cuidada dos custos:</p> <ul style="list-style-type: none"> Suprimentos Logísticos Operacionais <p>Dois Abordagens: Redução de Custos - "abordagem simplista" Eliminação de Desperdícios e Criação de Valor</p> <p>Lean Thinking</p> <p>3</p>
<p>PROCESSOS GORDOS</p> <p>4</p>	<p>Onde procurar a gordura ?</p> <p>As pessoas estão no coração de qualquer empresa. Elas moldam a sua cultura e criam processos que albergam gordura.</p> <p>As ações das pessoas revelam uma óbvia tendência para a gordura - quer se trate de gastos excessivos ou de hábitos de desperdício.</p> <p>Mas também existem formas de gordura menos óbvias, tais como a subutilização do talento, o dispêndio de energia em conflitos internos e a resistência cultural à mudança.</p> <p>5</p>	<p>Aquilo que é óbvio é fácil de se ver e de se eliminar, desde que haja vontade para isso.</p> <p>Mas também é necessário um discernimento profundo para detectar as formas subitas de gordura, e medidas muito mais drásticas para as corrigir.</p> <p>Podemos encontrar gordura nos líderes, nos empregados e em toda a empresa.</p> <p>6</p>
<p>O pessoal do gabinete toma o exemplo dado pelos chefes e emula os comportamentos de desperdício.</p> <p>7</p>	<p>Uma forma de gordura mais subtil aparece quando o processo incorpora actividades que não são óptimas.</p> <p>A escolha das melhores actividades pode não ser óbvia para aqueles que participam no processo.</p> <p>8</p>	<p>Todos os processos precisam de ser atualizados e melhorados ao longo do tempo.</p> <p>Em certas ocasiões, os criadores dos processos têm dificuldade em determinar as proporções exatas da mudança.</p> <p>"Não sei do meu bote!" é uma atitude que prevalece na cultura gorda.</p> <p>9</p>
<p>Uma cultura inapropriada conduz à ineficácia e à gordura.</p> <p>10</p>	<p>As necessidades das pessoas conduzem à gordura.</p> <p>A realização dos desejos das pessoas e das suas aspirações pode criar gordura numa empresa.</p> <p>11</p>	<p>TRABALHO FÁCIL</p> <p>ENTREGAS</p> <ul style="list-style-type: none"> Conter despesas Adaptar sigilosos Deixar um bom momento cultural Comprar qualquer coisa Idonear o cliente Pagar o preço na realidade Fortalecer na mente Fazer o suficiente Aumentar o número de empregados <p>12</p>
<p>TRABALHO ÁRDUO</p> <ul style="list-style-type: none"> Preparar despesas Desprender sigilosos Não dar nenhuma satisfação Evitar qualquer coisa Definir o cliente Empenhar pessoas para fazer Medir Terminar o trabalho no momento Aumentar a produtividade <p>13</p>	<p>Sobrevivência</p> <p>A necessidade de sobreviver motiva qualquer um.</p> <p>O instinto de sobrevivência de um indivíduo pode facilitar ou dificultar a vida de uma empresa, dependendo do seu comportamento de sobrevivência estar ou não em sintonia com os objectivos da empresa.</p> <p>14</p>	<p>O comportamento de sobrevivência do indivíduo pode estar mal sincronizado com os objectivos e com as estratégias que asseguram o bem estar da empresa.</p> <p>15</p>
<p>Características de sobrevivência:</p> <ul style="list-style-type: none"> Perceber sucesso Controlar o medo Aprender os factos Transferir as ideias <p>16</p>	<p>Quando uma força, tal como uma nova tecnologia, ameaça as formas familiares de fazer as coisas, um indivíduo com instinto de sobrevivência mal dirigido combaterá a ameaça.</p> <p>17</p>	<p>Origens do Lean Thinking - TPS</p> <p>O TPS - Toyota Production System é um sistema de gestão industrial desenvolvido por Taiichi Ohno.</p> <p>Este sistema tem como suporte as filosofias de melhoria contínua, introdução de práticas de prevenção de erros, introdução do sistema pull, empowerment, tornando os processos flexíveis, orientados à satisfação do cliente, através da eliminação e gestão dos desperdícios.</p> <p>18</p>

O pensamento magro potencia o valor aos clientes orientando a sua ação no sentido da eliminação das **ineficiências**, ou seja:

- MURI - fazer as coisas de maneira diferente! **Uniformização do trabalho**
- MURA - fazer muito ou pouco!
Adoção do sistema JIT procurando fazer apenas o necessário e quando pedido.
- MUDA (desperdício) - tudo o que não cria valor é desperdício e como tal deve ser eliminado.

Conceito de Muda

No TPS foram identificadas 7 fontes de desperdício (**muda** em japonês), que condicionam as atividades que criam valor a apenas 5 a 20% do total do lead time.

Outros desperdícios:

- Não aproveitamento do potencial (talento) das pessoas

O DESPERDÍCIO NAS ORGANIZAÇÕES

- Papéis (burocracia);
- Demaisados níveis hierárquicos;
- Tempo e outros recursos mal aproveitados;
- Subestimar a capacidade/valor das pessoas nas organizações;
- Transportes e movimentações;
- Controles e inspeções;
- Acertos e ajustes (setup);
- Defeitos e erros (errar sai caro);
- Stoço (de tempo e de materiais);
- E muitos mais...

Evolução até Lean Thinking...

LEAN THINKING

O termo **Lean Thinking** foi cunhado em 1996 por Womack and Jones, no seguimento dos seus trabalhos de investigação sobre os métodos produtivos da indústria automóvel:

International Motor Vehicles Program

Desenvolvido no MIT entre 1985-1990. Custo: 1 milhão US\$. Cópia global de benchmarking da Indústria Automóvel focada nas seguintes áreas:

- Desenvolvimento de Produto
- Gestão da Cadena de Fornecimento (Supply Chain)
- Gestão de Operações e Manufatura
- Interação com Clientes

LEAN THINKING - Definição

Lean Thinking é uma filosofia de gestão, onde a implementação de processos e a sua evolução continua baseia-se:

- Flexibilidade produtiva e a qualidade intrínseca dos produtos/serviços - **Centrado no Cliente**;
- Focalização da **redução/eliminação de desperdícios**;
- Melhoria Contínua e **empowerment** dos colaboradores.

Definição Lean - Eliminação de desperdícios tendo como objetivo a criação de Valor

LEAN THINKING - Definição

Ao contrário da abordagem tradicional, que se baseia na orientação de esforços de aumento de produtividade das atividades que criam valor, o segredo está no potencial de melhoria que pode ser obtido otimizando as atividades associadas a desperdícios.

uma simples ilustração...

ESTAMOS AQUI!

TEMOS DE AQUI CHEGAR PARA BATER A CONCORRÊNCIA!

PRINCÍPIOS LEAN THINKING

LEAN THINKING - Definição de Valor

Não é fácil definir "valor" dada as múltiplas interpretações atribuídas ao conceito;

O valor é **sempre definido pelo cliente** e refere-se às características e funcionalidades dos produtos/serviços que satisfazem as necessidades e expectativas dos clientes;

Não é fácil medir o valor dada a presença de componentes não quantificáveis ou intangíveis;

Valor é o que se leva, preço é o que se paga

O que qualquer cliente pretende é que o preço que paga seja justificado pelo valor que leva. Se assim não for, de certo que o cliente procurará um fornecedor que lhe garanta um preço mais justo.

LEAN THINKING - Mudança Cultural

- Participação de todos
- Empenho da Gestão de Topo
- Decisões em consenso
- Criação de uma onda de mudança
- Formação, Treino, Educação
- Fomentar trabalhos em equipa e projectos
- Integração entre o planeamento e execução
- Geração de soluções através da iniciativa dos colaboradores, no seguimento do seu enriquecimento pessoal e profissional

LEAN THINKING - Métodos e Ferramentas

Definir uma cadeia de valor

- É uma série de passos que têm que ser desenvolvidos na sequência correta para criar valor para o cliente;
- A cadeia de valor completa inclui informação do fluxo de todos os processos que constituem esta cadeia de valor;
- A cadeia de valor inclui todas as tarefas, as que **criam valor**, as que **não criam valor** e as que **não criam valor mas são necessárias**.

Se existe um produto, serviço ou processo para um cliente, existe uma cadeia de valor

Porquê mapear a cadeia de valor?

- Ajuda a visualizar mais do que o nível do processo;
- Permite-nos ver as fontes de desperdício;
- Define os pontos de colocação de melhoria.

VSM cria um conhecimento comum de compreensão da realidade e de possibilidade de melhoria

VALUE STREAM MAPPING

"Go to See"

- Listar todos os passos realizados para executar a operação (desde que começa a executar até que começa a executar a próxima operação);
- Observe e registre o tempo de todos os passos/tarefas da operação;
- Registrar se cada passo/tarefa é manual ou automático;
- Anotar quantas partes são processadas simultaneamente;
- Registrar se os passos/tarefas dados criam valor, não criam valor ou não criam valor mas são necessários;
- Procurar o desperdício e identificar oportunidades de melhoria;
- Reportar os dados recolhidos à equipa.

Atividade que cria valor

Atividade que muda/transforma material ou informação para responder aos requisitos do cliente.

Atividade que não cria valor

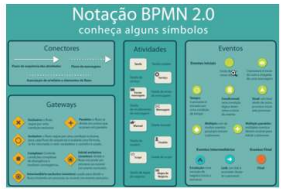
São todas as atividades que consomem tempo, recursos ou espaço, mas não transformam/mudam material ou informação.

Atividade que não cria valor mas necessária

São todas as atividades que consomem tempo, recursos ou espaço, mas não transformam/mudam material ou informação.

- Waste = Desperdício, isto é qualquer atividade que absorve recursos mas não cria valor.
- Desenvolver uma compreensão teórica de desperdício ajuda-nos a ver como é o desperdício acontece.
- A remoção dos desperdícios requer intuição, criatividade, coragem e energia.

"O olhar atento para os desperdícios deverá ser mantido atento independente de como pareça."

<p>Cliente / Fornecedor:</p> <p>Cliente: Para quem é criado o produto ou serviço (quem o compra, quem o utiliza)?</p> <p>Fornecedor: Quem é responsável pela criação do serviço/produto e produção?</p> <p>Um cliente também pode ser uma parte interna, um cliente interno.</p> <p>Fornecedor: É a parte que entrega o resultado, ou seja, a parte responsável pelo produto ou serviço final.</p>	<p>Entrada / Saída:</p> <p>Input: A coisa ou evento que desencadeia o processo.</p> <p>Output: O resultado (o produto/serviço) produzido pelo processo.</p> <p>Por vezes, a saída de um processo é utilizada como entrada para o processo seguinte.</p> <p>O input é algo que é transformado, armazenado, utilizado ou processado.</p> <p>O que é desencadeia o processo?</p> <p>O output é o produto ou serviço tangible que é entregue no final do processo.</p> <p>Exemplo:</p> <p>Input: Chamada telefónica, pedido, alerta, reclamação.</p> <p>Output: Um produto, tal como uma cadeira, empilhador, etc. Ou um serviço, tal como uma aplicação de segurança, limpeza, fornecimento de uma temperatura, etc.</p>	<p>Ferramentas:</p> <p>As ferramentas são as coisas (máquinas, equipamento, etc.) necessários para poder executar o processo.</p> <p>Que ferramentas são utilizadas durante o processo? Que máquinas, documentos, software, e outros instalações (equipamento, equipamento) utilizam os atores na execução das suas atividades como parte de um processo?</p> <p>Exemplo:</p> <p>Equipamento de proteção pessoal.</p> <p>Máquinas ou aplicações de software específicas.</p>
<p>Atores:</p> <p>Quem é responsável pelo (proprietário do) processo e quem está envolvido no processo?</p> <p>O proprietário do processo é a pessoa responsável pela definição, funcionamento e ajuste dos processos.</p> <p>Várias das atividades que compõem um processo são realizadas por pessoas.</p> <p>Essas pessoas são consideradas como atores com um papel específico.</p> <p>A atribuição de tarefas, responsabilidades e responsabilidades a estes atores é um fator crucial para assegurar a eficácia e eficiência de um processo.</p> <p>Exemplo: Em princípio, qualquer colaborador pode estar envolvido ou ser responsável por um processo.</p> <p>Por exemplo, Gestor de Relações com Clientes, Gestor de Produção, Chefe de Equipa ou Secretária.</p>	<p>Estrutura:</p> <p>Todas as condições prévias, requisitos (normais), planos e documentos políticos que desempenham um papel no controlo do processo.</p> <p>Muitos processos estão sujeitos a legislação e regulamentos ou normas. Estes entram em jogo no controlo e definição de um processo.</p> <p>A política ou diretrizes internas da empresa podem também ter impacto no processo.</p> <p>Exemplo:</p> <ul style="list-style-type: none"> • Cláusula da qualidade; • Norma ISO; • Regulamentos; • Licenças. 	<p>Riscos / Medidas:</p> <p>O risco é a possibilidade de ocorrer um evento, multiplicado pelas consequências desse evento. As medidas são as medidas tomadas para mitigar os riscos.</p> <p>Os processos podem vir com riscos. A identificação dos riscos associados a um processo é parte integrante da definição desse processo, tal como a listagem das medidas que podem ser tomadas para mitigar esses riscos.</p> <p>Exemplo: Um banco que emite um empréstimo expõe-se ao risco. Exatidão será dizer que os fatores bancários em tal risco, porque uma certa percentagem de empréstimos implica riscos. Os custos de tais empréstimos de risco são estimados e subsequentemente refletidos na preço do empréstimo, ou seja, na taxa de juro.</p>
<p>KPI:</p> <p>Os indicadores de desempenho são unidades de medida, tal como prazos de entrega, prazos, resultados mínimos alcançados, etc.</p> <p>Explicação: Uma unidade mensurável que fornece informações sobre o funcionamento de um processo específica, e a medida em que os objetivos estabelecidos são alcançados. Cada objetivo deve cumprir os critérios SMART.</p> <p>SMART = Específica, Mensurável, Alcançável, Realista, Temporal.</p> <p>Exemplo: O processamento de faturas, incluindo a geração, não deve demorar mais de 3 dias. KPI: tempo máximo de entrega de 2 dias. A média de ausência por semana para o ano completo de 2021 não deve exceder 3%.</p> <p>KPI: taxa de ausência para 2021 inferior ou igual a 3%.</p>	<p>O que é BPMN (Business Process Management Notification)?</p> <p>Esta notação foi idealizada em primeiro lugar para melhorar a comunicação entre setores e pessoas, já que estrutura e mostra o processo e as suas respetivas fases.</p> <p>No entanto, ela foi muito mais que isso, permitindo a ilustração do processo de uma maneira nunca vista antes.</p> <p>Só se consegue mudar e que se entende, e para se conseguir entender tem que se conseguir visualizar.</p> <p>A notação BPMN específica e <u>processo de negócio</u> tem diagrama que é fácil de ler.</p> <p>A diagrama BPMN é intuitivo e permite a representação de detalhes complexos do processo. A <u>simbologia BPMN</u> serve como uma linguagem padrão, colocando um fim na lacuna de comunicação entre o <u>modelagem do processo</u> e sua execução.</p> <p>Por esse motivo, é considerada hoje a língua franca para comunicação no mundo das negócios.</p>	<p>Como a notação BPMN é realizada?</p> <p>O que é a linguagem BPMN faz é representar cada ação com um símbolo. Vamos tomar como exemplo uma agência de viagens que recebe um pedido de um possível cliente.</p> <p>O processo de planeamento de viagem começa com esse pedido, e passa pelos orçamentos de hotel, passagens de avião, aluguer de carro e tours turísticos. Depois, tudo é reunido e consolidado, terminando com o envio da proposta ao cliente.</p> <p>Se for aceite, um novo processo iniciado, o processo de venda. Cada um desses passos e a relação entre eles é representado no diagrama BPMN por um símbolo, fazendo com que o processo se torne um padrão dentro da empresa, e que seja entendido por todos.</p> <p>Podemos identificar quatro tipos de símbolos BPMN 2.0 referentes a elementos que representam o comportamento do processo:</p> <ul style="list-style-type: none"> • Objetos de fluxo; • Objetos de conexão; • Swim lanes; • Artefatos.
<p>Os objetos de fluxo são divididos em três tipos:</p> <ul style="list-style-type: none"> • Atividades – o trabalho que é executado, algo que é feito (por exemplo a cotação do hotel), simbolizados por quadrados; • Eventos – as ocorrências, algo que acontece (por exemplo o início do processo, o pedido do plano), simbolizados por círculos; • Gateways – pontos de decisão que determinam o caminho que o processo seguirá (por exemplo a decisão de considerar as informações); simbolizados por diamantes. <p>Sobre as swim lanes, existem dois tipos a analisar:</p> <ul style="list-style-type: none"> • Piscinas – representam processos e participantes no processo; • Rais – cada piscina possui várias raia, que simbolizam os papéis, áreas e responsabilidades no processo. 	<p>Objetos de conexão:</p> <p>Os objetos de fluxo são uma simbologia BPMN que precisa conectar-se entre si de alguma forma, e isso se dá através dos objetos de conexão.</p> <ul style="list-style-type: none"> • Fluxo de sequência – mostra em que ordem as atividades são executadas, e é simbolizado por uma linha cheia e uma seta acionante; • Fluxo de mensagem – indica quais as mensagens que fluem entre dois processos/piscinas, e é representado por uma linha tracejada, um círculo aberto e uma seta aberta no fim; • Associação – conecta os artefatos aos objetos de fluxo, e é simbolizado por uma linha tracejada. <p>Artefatos:</p> <p>Os artefatos são utilizados para agregar documentação visual ao diagrama. Um dos principais elementos do BPMN são os objetos de dados, que descrevem como os dados podem ser manipulados. Podem ser saída, entrada, data store e data object.</p>	<p>Principais símbolos usados na notação BPMN 2.0</p> <p>Seria extremamente longo apresentar todos os ícones e símbolos BPMN 2.0. Por isso, vamos apresentar apenas alguns deles, divididos em 4 tipos principais que são aplicados no desenho de processos BPMN.</p> <p>1. Conectores: elementos de ligação da sequência dos fluxos de trabalho.</p> <p>2. Atividades: representam o trabalho que será realizado.</p> <p>3. Gateways: mostram a ramificação e a reunião do fluxo de tarefas.</p> <p>4. Eventos: indicam eventos externos ao processo que o influenciam.</p> <p>1 - Conectores:</p> <p>Ligam diferentes elementos em um fluxo BPMN</p> <p>Fluxo de sequência das atividades:</p> <p>Fluxo de mensagem:</p>
<p>2- Atividades</p> <p>São as tarefas que devem ser realizadas. Podem ser discriminadas com pequenos símbolos BPMN no canto superior esquerdo do retângulo que as representam.</p> <p>3- Eventos</p> <p>Para todos os tipos de eventos, em regra, uma linha fina de contorno significa início (pode ser usada também a cor verde); uma linha dupla mostra um evento intermediário (pode ser usada a cor azul); e uma linha grossa indica um evento final (pode ser usada a cor vermelha); com algumas exceções em que não houver sentido haver um evento final desse tipo.</p> <p>É importante lembrar que dependendo do evento, diferentes consequências ocorrendo tanto no início, como na fase intermediária ou final do processo, segundo a notação BPMN 2.0.</p>	<p>Notação BPMN 2.0 conheça alguns símbolos</p> 	<p>Defina as responsabilidades</p> <p>Uma piscina e raia para agrupar as tarefas e definir as responsabilidades por elas.</p> 
<p>Adicione um iniciador</p> <p>Em relação a tarefa em um processo será iniciado, pode ser o recebimento de um email, por exemplo.</p> 	<p>Adicione tarefas e desvios</p> <p>Esses elementos determinam a lógica de seu processo, o caminho que as atividades seguem.</p> 	<p>Marque o fim do processo</p> <p>Um evento deve indicar o fim do processo. Por exemplo, encerramento iniciado.</p> 
<p>Exercício</p>		

Problem solving tools

Análise de causas



1

DIAGRAMA DE PARETO

- O Diagrama de Pareto é um método gráfico simples de análise, que permite discernir entre as causas mais importantes de um problema (as poucas e vitais) e as que as são menos importantes (as muitas e triviais).
- Vilfredo Federico Tamasso no séc XVII criou "Márquese de Pareto".
- Joseph Juran y Allen Lukelin chamaram regra dos "80-20"

2

Princípio de Pareto – Análise ABC

Este princípio também é conhecido como a Regra dos 80-20; Gestão por excepção - *trivial many, vital few*. (muitos triviais, poucos vitais)

- Baseado no trabalho de Vilfredo Pareto :
 - A maioria das situações são dominadas por poucos elementos vitais;
 - Implicação: concentrar recursos/esforços no elementos que causam maior impacto (vital) ignorando os demais (triviais).
- Aplicação na Gestão da Qualidade:
 - Uma pequena percentagem (ex. 20%) dos defeitos representam uma larga percentagem (ex. 80%) das queixas dos clientes.

3

COMO CONSTRUIR UN DIAGRAMA DE PARETO?

Passo 1: Identificar o Problema

- Identificar o problema na área de melhoria onde se vai a trabalhar.

Passo 2: Identificar os fatores

- Elaborar uma lista dos fatores que podem estar a provocar o problema, por exemplo, tipos de falhas, características de comportamento, tempos de entrega.

Passo 3: Definir o período de recolha

- Estabelecer o período de tempo dentro do qual se recolhem os dados: dias, semanas, meses.

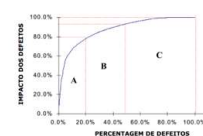
4

Exemplo:



5

Gráfico ABC



6

Brainstorming

O propósito de uma sessão de Brainstorming é o trabalho em grupo na identificação de um problema, e encontrar, através de uma intervenção participativa, a melhor decisão para um plano de ação que o solução tal problema.



7

Tempestade cerebral

- Solicita-se ao participantes que deem ideias sobre o problema;
- Durante a geração de ideias, não há críticas, avaliações, julgamentos ou defesa das ideias – apenas se emite a ideia;
- As ideias podem ser absolutamente loucas, impróprias, agressivas, utópicas, absurdas, "estupidas", absurdas, etc.;
- Quantidade é melhor que qualidade;
- Podem e devem surgir ideias sobre ideias;
- A associação de ideias é positiva.



8

- Cada ideia deve ser expressa em poucas palavras, evitando:
 - mas, se porque, ... - ideias óbvias;
 - Escrever o mais rápido possível;
 - Fuçou importa a correção/organização da ideia;
 - Todos devem participar;
 - Todas as ideias foram registadas;
 - Cada um seleciona 3 ideias e classifica-as;
 - Votação das ideias.



9

Dicas

- Existir um moderador
- No início da sessão explicar as regras
- Definir bem o problema
- Explicar o objetivo da sessão
- Utilizar cartões para escrever
- Dinamismo!



10

Os 5W2H



11

Os 5W2H

5W2H é um instrumento que facilita a interpretação objetiva e transparente do problema. Sendo o problema compreendido de diferentes pontos de vista, as decisões podem analisar quais as decisões mais rentáveis a tomar, para que o resultado final seja o melhor e mais coerente possível com o objetivo declarado no âmbito do projeto.

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5WH2	PROBLEMA	SOLUÇÃO
WHAT (What)	... é o problema?	... vai ser feito?
WHY (Why)	... ocorreu?	... foi definida esta solução?
WHEN (When)	... até quando? Desde quando é o caso?	... quando será feito?
WHERE (Where)	... até se encontra?	... será implementada?
WHO (Who)	... está envolvido?	... será responsável?
HOW (How)	... surgiu o problema?	... vai ser implementada?
HOW MUCH (How much)	... tem este problema?	... esta solução?

13

O que? deve notar-se aqui a descrição do problema, o objetivo do projeto e/ou o objetivo de melhoria que se propõe alcançar;

Quem? quem é responsável pela resolução do problema ou pela oportunidade de melhoria. A equipe designada para o resolver e quem são os clientes internos ou externos são algumas das formas de responder a esta parte;

Onde? neste espaço, a informação do local envolvido pelo problema deve ser registada, ou seja, onde é inserido. Será definida se é um sector específico ou mesmo em que operação ou máquina de produção opera;

Porquê? nesta fase é importante definir a razão pela qual é importante resolver este problema ou alcançar o objetivo proposto. Discutir sob que aspetos financeiros e qualitativos se vale a pena prosseguir com a resolução do problema e/ou com a realização do objetivo;

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Quando? a informação aqui está ligada ao tempo, ou seja, a partir de quando o problema ocorre e qual o prazo para a resolução, bem como as datas de entrega e o calendário para cumprir o objetivo do projeto;

Como? como funciona o processo pelo qual o problema está envolvido, é a questão a ser respondida. Que passos, atividades e variáveis relevantes podem afetar-lo. Uma dica aqui é utilizar um fluxograma para melhor o representar;

Quanto? aqui, a informação pode ser ligada à quantidade e ao custo, ou seja, quanto este problema já gerou despesas para a área envolvida e/ou para toda a empresa. Quanto investimento é necessário para a sua resolução, bem como quantos processos e produtos já afetou.

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Exemplo

Causa Raiz: Não foi feito estudo de carga;

Contro-Medida: Realizar um estudo de distribuição de carga. São, agora que temos o problema, a causa raiz e a contro-medida, vamos aplicar o 5W2H:

1.O que? Realizar um estudo detalhado de distribuição de carga;

2.Por que? A fim de possibilitar correções nos circuitos e evitar desconexões de energia e queima de aparelhos;

3.Onde? Toda a sala técnica;

4.Quando? O estudo deve ser concluído em até 30 dias;

5.Quem? João do departamento de manutenção elétrica;

6.Como? Utilizar multi-medidores de energia na derivação de cada circuito, medindo a tensão, corrente e potência e após realizar o registo em planilha eletrónica pontualizada;

7.Quanto? Esta atividade vai requerer a aquisição de 1 multi-medidor de energia e 20 horas/homem para execução totalizando \$ 4.000,00

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Diagrama de Causa-Efeito (Ishikawa – Espinha de Peixe)

- Desenvolvido por Kaoro Ishikawa, na Univ de Tóqui em 1943
- Ajuda-nos a ordenar diversas causas (ou factores) de uma forma lógica, relacionando as causas com o efeito
- Objectivo:
 - Determinar todas as causas possíveis de um problema para obter as causas mais prováveis do mesmo

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Porquê utilizar um diagrama C&E?

- Ajuda a determinar a causa-raiz de um problema ou característica da qualidade, utilizando uma abordagem estruturada;
- Incentiva a participação em equipa utilizando os conhecimentos do grupo do processo;
- Utiliza um formato padronizado, e de fácil análise para demonstrar a relação entre os factores;
- Indica causas possíveis de variação num processo;
- Aumenta o conhecimento de um processo, ajudando todos a aprender mais sobre os factores de trabalho e como se relacionam;
- Identifica as áreas onde se deverão recolher informações para análise posterior

18

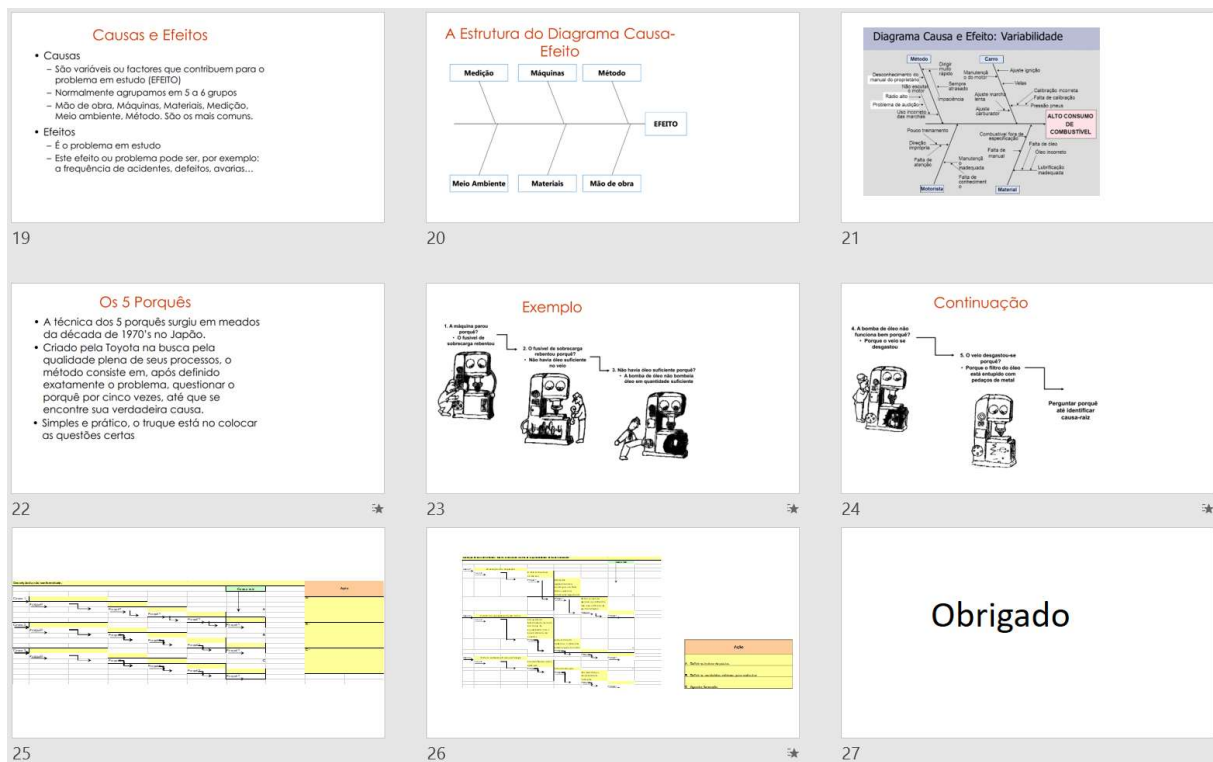


Figure 71 - Problem solving tools manual

APPENDIX 3 – DAILY KAIZEN - MEETING AGENDA

Kaizen Diário - Agenda de Reunião			
Frequência	Hora	Duração	Local
Diário	09:00	15 min.	Escritório Arroteia (Gabinete P&D)

Participantes:

Permanentes

Preparação:

Nº	Tema	Responsável	Quando
1	Atualização das tarefas no Plano de Trabalho	Cada colaborador	15 min. antes
2	Análise de Project Checklist	Coordenação	15 min. antes

Agenda:

Nº	Tema	Norma	Tempo (min)
1	Registo de Presenças	-	-
2	Orientação e organização Diária - Project Checklist (Dificuldades e orientação)	-	5 min. Cada UN.

Figure 72 - Daily Kaizen - Meeting agenda
(Kaizen Institute, 2021)

Kaizen Semanal - Agenda de Reunião			
Frequência	Hora	Duração	Local
Semanal - Terça -Feira	09:00	60 min.	Escritório Arroteia (Resilience)

Participantes:

Permanentes

Preparação:

Nº	Tema	Responsável	Quando
1	Atualização do Planeamento Semanal	Coordenação	Reunião de coordenação
2	Preenchimento dos Indicadores Semanais	Colaborador Responsável (Semanal)	15 min. antes

Agenda:

Nº	Tema	Norma	Tempo (min)
1	Orientação e organização Semanal - Foco para a Semana	-	5 min. Cada UN.
2	Análise dos Indicadores Semanais (Project Checklist)	-	10 min. Cada UN
3	Análise de desvios e definir contra medidas (urgentes e de rápida aplicação) + PDCA	-	15 min.

Figure 73 - Weekly Kaizen - Meeting agenda

Figure 74 - Monthly Kaizen - Meeting agenda

APPENDIX 4 – RECORD SHEET TEMPLATE TO COLLECT ACTIONS TO BE DEVELOPED FOR INDIVIDUAL ITEM

Table 39 - Record sheet template to collect actions to be developed for individual item
(adapted from Cameron and Quinn, 2006)

Actions to be develop - Dominant Characteristics		Actions to be develop - Organizational Leadership	
Clan Culture	Adocracy Culture	Clan Culture	Adocracy Culture
What do I stop doing or do less of?	What do I stop doing or do less of?	What do I stop doing or do less of?	What do I stop doing or do less of?
What do I should start doing or do more of?	What do I should start doing or do more of?	What do I should start doing or do more of?	What do I should start doing or do more of?
Hierarchical Culture	Market Culture	Hierarchical Culture	Market Culture
What do I stop doing or do less of?	What do I stop doing or do less of?	What do I stop doing or do less of?	What do I stop doing or do less of?
What do I should start doing or do more of?	What do I should start doing or do more of?	What do I should start doing or do more of?	What do I should start doing or do more of?

Actions to be develop - Management of Employees		Actions to be develop - Organization Glue	
Clan Culture	Adocracy Culture	Clan Culture	Adocracy Culture
What do I stop doing or do less of?	What do I stop doing or do less of?	What do I stop doing or do less of?	What do I stop doing or do less of?
What do I should start doing or do more of?	What do I should start doing or do more of?	What do I should start doing or do more of?	What do I should start doing or do more of?
Hierarchical Culture	Market Culture	Hierarchical Culture	Market Culture
What do I stop doing or do less of?	What do I stop doing or do less of?	What do I stop doing or do less of?	What do I stop doing or do less of?
What do I should start doing or do more of?	What do I should start doing or do more of?	What do I should start doing or do more of?	What do I should start doing or do more of?

Actions to be develop - Strategic Emphases		Actions to be develop - Criteria of Success	
Clan Culture	Adocracy Culture	Clan Culture	Adocracy Culture
What do I stop doing or do less of?	What do I stop doing or do less of?	What do I stop doing or do less of?	What do I stop doing or do less of?
What do I should start doing or do more of?	What do I should start doing or do more of?	What do I should start doing or do more of?	What do I should start doing or do more of?
Hierarchical Culture	Market Culture	Hierarchical Culture	Market Culture
What do I stop doing or do less of?	What do I stop doing or do less of?	What do I stop doing or do less of?	What do I stop doing or do less of?
What do I should start doing or do more of?	What do I should start doing or do more of?	What do I should start doing or do more of?	What do I should start doing or do more of?

APPENDIX 5 – MISSION, VISION AND VALUES OF THE CASE STUDY



**WE OFFER
ENERGY SOLUTIONS
PROUDLY DOING IT** 

MISSION, VISION AND VALUES

MISSION

To be a financially sound and profitable company, operating in the energy area, committed to global sustainability and delivering added value to all stakeholders.

VISION

To be recognized as leaders of excellence in everything we do, through a commitment to innovation and continuous improvement.

VALUES

EXCELLENCE

We improve and exceed our standards of quality and efficiency every day.

INNOVATION

We are curious, creative and able to challenge the status quo. If there is a better way, we will find it.

HONESTY

We act with honour and justice and we commit ourselves to high ethical standards.

SHARING AND COMMITMENT

United and committed we support each other to stronger achieve our collective goals.

RESILIENCE

We adapt easily and optimistically to global demands and challenges.

AMBITION

We pride ourselves on achieving exceptional results.

Matosinhos, 2nd February 2021


Company's Board



Figure 75 - Mission, vision and values of the case study

APPENDIX 6 – DAILY KAIZEN - MEETING AGENDA NEW VERSION

Kaizen Diário - Agenda de Reunião			
Frequência	Hora	Duração	Local
Diário	09:15	15 min.	Escritório Arroteia (Gabinete P&D)

Participantes:

Permanentes

Preparação:

Nº	Tema	Responsável	Quando
1	Atualização das tarefas no Plano de Trabalho	Cada colaborador	15 min. antes
2	Análise do plano de trabalhos	Coordenação	15 min. antes

Agenda:

Nº	Tema	Norma	Tempo (min)
1	Concretização das tarefas e respetivos outputs definidas para o dia anterior. Caso contrário, porque;	-	1 min. cada elemento.
2	Alertas de interrupção de fluxo	-	Quando necessário
3	Revisão das tarefas o dia e potenciais constrangimentos	-	1 min. cada elemento.
4	Seguimento das ações a fazer	-	Quando existem.

Figure 76 - Daily Kaizen - Meeting agenda new version

Kaizen Semanal - Agenda de Reunião			
Frequência	Hora	Duração	Local
Semanal - Terça -Feira	09:00	120 min.	Escritório Arroteia (Resilience)

Participantes:

Permanentes

Preparação:

Nº	Tema	Responsável	Quando
1	Atualização do Planeamento Semanal	Coordenação	Reunião de coordenação
2	Preenchimento dos Indicadores Semanais	Colaborador Responsável (Semanal)	15 min. antes

Agenda:

Nº	Tema	Norma	Tempo (min)
1	Análise dos problemas identificados durante a semana	-	15 min.
2	Completar PDCA abertos	-	30 min.
3	Iniciar o PDCA para cada problema identificado	-	45 min.
4	Análise dos Indicadores Semanais	-	15 min.
5	Análise do planeamento proxima semana	-	15 min.

Figure 77 - Weekly Kaizen - Meeting agenda new version

Kaizen Mensal - Agenda de Reunião			
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Frequência	Hora	Duração	Local
Mensal - Primeira Terça-Feira do Mês	09:00	120 min.	Escritório Arroteia (Resilience)

Participantes:

Permanentes

Preparação:

Nº	Tema	Responsável	Quando
1	Atualização do Planeamento Mensal	Coordenação	Reunião de coordenação
2	Recolha dos KPI's	Coordenação/ Direcção	Reunião de coordenação
3	Recolha de Info Mensal	Direcção	Semana Anterior

Agenda:

Nº	Tema	Norma	Tempo (min)
1	Acabar os pontos inacabados	-	30min.
2	Trabalho em pontos mais complexos	-	60min.
3	Analisar todos os KPI definidos	-	15 min.
4	Identificar necessidades de formação	-	(não definido)
5	Confirmar que todas as normas definidas durante o mês são publicadas e que a equipa tem a formação necessária (se aplicável)	-	15 min.

Figure 78 - Monthly Kaizen - Meeting agenda new version

