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ORGANIZACINĖS KULTŪROS ĮTAKA *LEAN* SISTEMOS ĮGYVENDINIMUI	IMPACT OF ORGANIZATIONAL CULTURE ON IMPLEMENTATION OF LEAN SYSTEM

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ABBREVIATIONS

Acronym	Definition
OC	Organizational culture
NC	National culture
CVF	Competing Values Framework
OCAI	Organizational culture assessment tool
TPS	Toyota Production System
LM	Lean management

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INTRODUCTION

Relevance of the topic. To be survived to global markets, it has been a necessity for organizations to adopt the latest management innovations for delivery their service and products with a competitive advantage (Knol et al., 2018; Nordin et al., 2012; Shah & Ward, 2003). During the last decades, lean originated in Toyota Production System has been adopted as an innovative competitive strategy all over the world (Knol et al., 2018; Losonci & Demeter, 2013). Lean system can be considered a long-term approach to run a business with concept of continuous improvement. It can be stated that fundamental benefits of lean strategy is the elimination of waste in order to produce and deliver quality products or services in due time and with optimal costs (Danese et al., 2018; Shah & Ward, 2003). According to the findings of Industry Week research in 2016 in which has been analyzed the opinion of 153 senior executives and managers, the quality management and lean manufacturing systems were the first priority among the list of specific technology investments to achieve their business growth prospects (IndustryWeek, 2016).

The remarkable achievements of Toyota and other organizations by implementing lean system as an improvement strategy has pushed many companies toward follow lean principles with strong motivation globally; however, many such these efforts have failed without any expected results and the reported statistics about the failure of Lean projects are disappointing and worrying (Bortolotti et al., 2015; Liker & Rother, 2011; Sartal et al., 2020). For instance, an Industry Week report in 2007 mentioned that only one in four of American companies which adopted some kinds of lean principles were satisfied with the outcome (Netland, 2016; Pay, 2008). Some other reports have mentioned high failure rates even over than 50% rate (Coetzee et al., 2016; Kallage, 2006; Mirdad & Eseonu, 2017). The Shingo Prize committee found that several organizations which won the Shingo lean excellence prize in the past lost their lean performance (Liker & Rother, 2011).

Based on recent studies regarding the cultural aspects of lean system implementation and maintenance, it seems that one of the main challenging factor in success or failure of lean system implementation has been human-related issues and or cultural issues in organizations (Bortolotti et al., 2015; Erthal & Marques, 2018; Liker

& Rother, 2011; Pakdil & Leonard, 2015, 2017; Taherimashhadi & Ribas, 2018; Wangwacharakul et al., 2014). Therefore, given the willingness of organizations to embrace lean principles in their organization and the failure statistics of their projects and their causes, it could be important to investigate the relationship and impact of organizational culture (OC) on the implementation of lean system in organizations.

Practical and theoretical value of the topic. The lean strategy like any other productivity improvement initiative has been facing many challenges and barriers during implementation and maintaining in originations (Lucey et al., 2004, 2005; Netland, 2016; Saad et al., 2006). According to Nordin et al. (2012), the main reason of all difficulties is the necessity of change in many aspects and stages within lean transformation in organizations. They stated that for lean transformation, staff needs to understand what the lean is and what organizational change management principles are. They concluded critical success factors for lean transformation are consist of effective leadership, comprehensive change plan, team development, communication, training, change agent, culture readiness, employee autonomy, lean change evaluation, worker empowerment, and rewarding system (Nordin et al., 2012). Saad et al. (2006) stated that four main factors that are critical for the lean implementation are consist of leadership and management, finance, skills and expertise, and organizational culture. In another study, it has been concluded three key CSFs for lean implementation including 'management commitment and involvement', 'training and education' and 'employee participation and empowerment' (Netland, 2016). According to Hines et al. (2020), the secret of successful lean implementation in some companies has been lean evolution through three stages from tool-based change, systems-based change, to cultural-based change (Hines et al., 2020).

Some scholars have considered lean practices into two categories consist of hard practices and soft practices, and mentioned human-related issues and or cultural issues as the soft practices should be stressed in process of lean transformation and maintenance (Bortolotti et al., 2015; Hines et al., 2004; Liker & Rother, 2011). Based on GLOBE model of OC, it was indicated that the successful lean plants compared to unsuccessful lean plants were characterized by higher institutional collectivism, future orientation, and humane orientation and lower assertiveness (Bortolotti et al., 2015). Taherimashhadi and Ribas (2018) believed that it is included a specific culture in lean system. They studied the relationship between NC, OC, and LM and theorized a lean culture model. The purpose of modeling was to create a framework for measuring and evaluating organizational culture with compered to lean culture, and to identify and manage OC weaknesses before implementing the principles of lean in order to successfully implement a lean system (Taherimashhadi & Ribas, 2018). In another study, considering Hofstede's framework in

the OC level, it was found that there is a positive relationship between some dimensions such as tight control, employee-oriented, professional and open system approaches with LM system (Erthal & Marques, 2018).

Motives for choosing the particular topic. This topic was chosen due to the high failure rate of lean projects globally, and the increasing trend of research concerning cultural issues during the implementation of lean systems in the organization and its strong and significant effects on success and failure of lean projects. It was also chosen because of the researcher interests and his backgrounds in lean system and quality management innovations. Moreover, from a practical point of view, the results could help Lithuanian and Iranian organizations to improve and adjust cultural factors to succeed lean system implementation, and analyze and compare their own strengths and weaknesses with one another in relation to cultural issues with regard to national cultural differences.

The research object is the impact of organizational culture on lean system implementation in Lithuanian and Iranian organizations.

Aim of study. This research aims at studying and examining the impact of organizational culture on the process of lean implementation and maintenance in Lithuanian and Iranian organizations.

Objectives of research

1- To identify concepts, models and dimensions of OC;
2- To identify concepts, principles and tools of lean system;
3- To identify the impact of OC types on lean system implementation;
4- To compare the impact of OC types on the implementation of lean system between Lithuanian and Iranian organizations.

Research methods. In this study first, it has been used the research literature analysis as the theoretical method to gather secondary data from studies, surveys, or experiments that have been run in various research. Secondly, a quantitative approach has been applied through a survey to examine the impact of OC on lean system, and gather primary data by questionnaire in case studies. The questionnaire is based on Competing Values Framework (CVF) of Cameron and Quinn model (2011) and 4P model of Liker (2004). In additions, the statistical method has been used to analyze the answers from the respondents and hypothesizes by SPSS software. Then, based on the results of the data analysis, the differences in the status of OC types with regard to the level of leanness of case studies in Lithuania and Iran has been discussed and concluded.

Structure of the Thesis. The remainder of the research has been organized in three main chapters. Literature review is analyzed in chapter 1. The concepts of OC and Lean system are discussed in this chapter, and in addition it is reviewed some models, frameworks and theories about these two concepts. It is argued the relationship of OC and Lean system in the part 3 of this chapter. Chapter 2 is provided the research design of this study which created to address the research question and hypotheses. In chapter 3, the results of research are showed and analyzed, and finally in the conclusions part, some recommendations and advices have been determined to improve the situations of case studies.

Key words: Lean system, Organizational culture, Competing Values Framework, 4P model of Liker

1. LITERATURE REVIEW

1.1. Review of literature on organizational culture

The concept of organizational culture has been studied remarkably within the 1980s once publications appeared claiming that organizational culture can be the core competitive advantage for an organization to impact on the performance of corporate (Zhang & Li, 2013). The idea of culture has been debating and defining among scholars with different approaches and attitudes during these years. This trend of discussion gives evidence that culture can consider as an importance concept, but it can make ambiguity and complexity for each scholar and therefore the experts if definitions are fuzzy and usages are inconsistent (Schein, 2010).

The term "culture" can define as a collection of beliefs, values and behaviors which has been formed and used by a society (Lim, 1995). The culture of a group can define as a pattern of shared basic assumptions that was used by a group to consider issues of external adaptation and internal integration, and to be transferred to new members as the appropriate way to understand and reaction with regards to those issues (Schein, 2010). It has been stated that culture is an abstraction, however the forces which comes from culture in social and organizational situations are powerful. If everyone does not recognize the process of these kind of forces, they can be negatively affected (Schein, 2010). It was defined some different levels as degrees to which the cultural phenomenon is visible to the observer (see fig.1), and argued the importance of analyzing and studying between several layers of culture (Hogan & Coote, 2014; Schein, 2010).

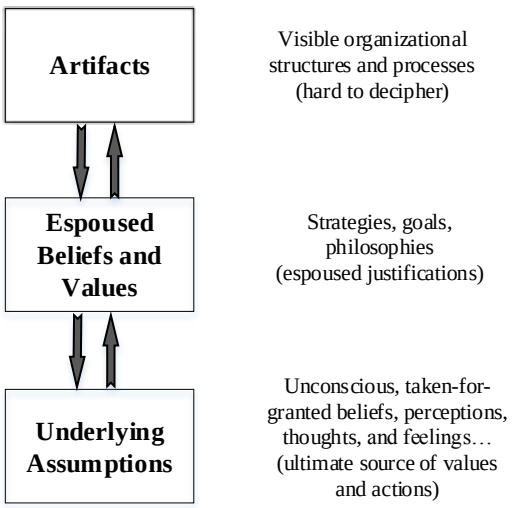

Figure 1. **Levels of organizational culture.**
Source: Schein, 2010.

Group can be considered the key words in definition of culture which has been used to elaborate social units of all sizes (Schein, 2010; D. D. Warrick, 2017). In other words, the term "group" can be attributed to a whole organization or any group of people of any size such as a country, sports team, symphony, or family. The point is those groups of people, regardless of group size, can create unique form of cultures. The term "organizational culture" is often used to refer to the culture of a whole organization or any unit of people working together within the organization by scholars (D. D. Warrick, 2017).

There are various kinds of organizational culture definitions, however, OC commonly refers to the organizational values which are formed by norms, artifacts and observed in patterns of behavior (Hogan & Coote, 2014; Homburg & Pflesser, 2000; Schein, 2010). Schein's (2010) definition of OC is probably the most widely accepted, but almost all organizational scholars concur that the main content of culture consist of the values, beliefs, and assumptions which are set by the members of an organization and the way in which they convey the norms and shared meaning to others (Alvesson, 2011; Cameron & Quinn, 2011; D. Denison et al., 2014; D. R. Denison & Mishra, 1995). In practical way, the organizational culture elucidates the atmosphere in which people work and the impacts of this on how they feel, think and behave in the workplace (D. Warrick et al., 2016; D. D. Warrick, 2017).

Value has been one of the most important components of the definition of organizational culture in many research (Van den Berg & Wilderom, 2004); However, in some research, it has been indicated that practices can be the key point to address differences among organisations better than values (Hofstede, 2001; Van den Berg & Wilderom, 2004). Therefore, Van den Berg and Wilderom (2004) focused on work practices and defined OC as shared perceptions of organizational work practices within organisational units that can differ from other organisational units. They believed that for employees it is difficult to understand values directly. But values can be learned through the existing practices of an organisation, department, or work unit (Van den Berg & Wilderom, 2004).

The concept of Organizational culture probably remains a controversial subject among researchers. In spite of its conceptualization with different attitudes, it has been applying by researchers, managers and strategists widely (Jung et al., 2009). This fact is reflected in the numerous nature and characteristics of the identified instruments, which propose dimensional, typological, quantitative and qualitative approaches, as well as combinations thereof (Jung et al., 2009).

The conceptualizations of organizational culture can consider as a continuum with two different approaches which exist in two extremes of this continuum (Lim, 1995). In the one side of this continuum is the process-oriented approaches which have been defining OC as a continuous recreation of shared meaning. Schein's (2010) model is a typical sample of these approaches which used a qualitative method to study OC, where interpretation and meaningfulness are preferred to the frequency of occurrence (Lim, 1995). This category of approach is able to prepare much in-depth information about an organization (Lim, 1995). In the other side of this continuum is classification approaches which have proposed OC as a range of ideal types so that supported by two or more variables (Lim, 1995). Hofstede's model (2001) is one of the well-known studies related to this approach which was defined with six dimensions including Power Distance, Uncertainty Avoidance, Individualism/Collectivism, Masculinity/Femininity, Long/Short Term Orientation, and Indulgence/Restraint to differentiate between nationalities, and six other dimensions for OC study which are consist of process-oriented versus results-oriented, job-oriented versus employee-oriented, professional versus parochial, open systems versus closed systems, tight versus lose control, and pragmatic versus normative (Hofstede, 2001, 2011).

Most scholars emphasized that a qualitative approach to cultural studies is preferable to a quantitative approach and the use of variables and outcomes (Sackmann, 1991); however, quantitative attitude can have potential to prevent the integration of OC with other organizational issues which are usually discussed in terms of variables, dimensions, causes, or effects (D. R. Denison & Mishra, 1995). One of the well-known organizational culture models with a quantitative approach is D. R. Denison (1990)'s model which was developed to study about impact of OC on effectiveness (D. R. Denison, 1990; D. R. Denison & Mishra, 1995). The model has consisted of four traits: (i) involvement, (ii) consistency, (iii) adaptability, and (iv) mission (see fig.2). In this model, three indicators were defined to measure each trait. It was concluded that there is a significant relationship between each of the four cultural traits and organizational effectiveness in their studies (D. R. Denison, 1990; D. R. Denison & Neale, 1996).

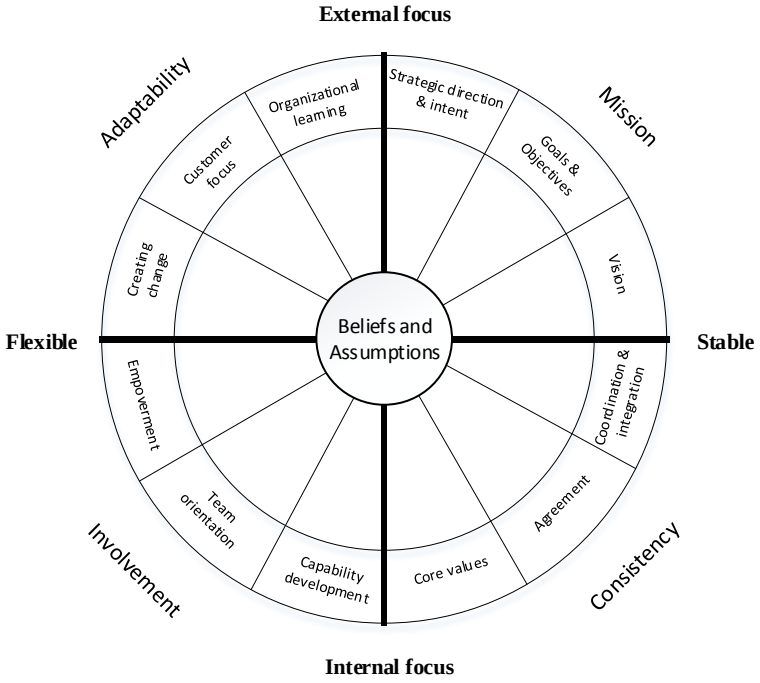

Figure 2. **Model of Diagnosing Organizational Culture.**
Source: Denison, 1990.

Another influential and extensively used models in the area of OC research is based on Competing Values Framework (CVF) which was proposed first by Quinn and Rohrbaugh in 1983 for studying organizational effectiveness and leadership roles, and then has developed by Cameron and Quinn to describe OC types (Helfrich et al., 2007; Naranjo-Valencia et al., 2016; Pakdil & Leonard, 2015; Yu & Wu, 2009). Cameron and Quinn (2011) classified their framework in four types of OC which were called clan, adhocracy, hierarchy, and market, and used two dimensions flexibility and discretion versus stability and control, and external focus and differentiation versus internal focus and integration (see Fig. 3) (Cameron & Quinn, 2011). The framework is also based on six organizational culture dimensions including dominant characteristics, organizational leadership, and management of employees, organizational glue, strategic emphases, and criteria for success. Moreover, the Organizational Culture Assessment Instrument (OCAI) has been proposed by the authors of this framework to assess the OC profile of organizations based on six mentioned OC dimensions (Cameron & Quinn, 2011).

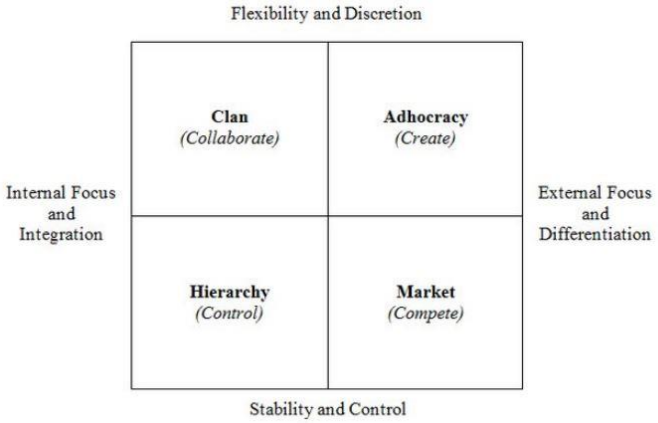

Figure 3. **The Competing Values Framework.**
Source: Cameron & Quinn, 2011.

The hierarchy culture which is based on Max Weber studies is control-oriented but it focuses on the internal organization. Its key values are Clear lines of decision-making authority, bureaucracy, and control and accountability mechanisms. Organizations with a market culture focus on dealing with (mainly) external areas such as suppliers, customers, contractors, licensees, unions, and regulators. This type of culture is a results-oriented workplace. The key value is achieving goals of market share and penetration. A clan culture which is come from some research about differences between Japanese and American firms was characteristic by team working, employee involvement and corporate commitment to employees. Finally, an adhocracy culture which was emerged by the world shifting to information age encourages adaptability, flexibility, and creativity. An important challenge for adhocracy organizations is to produce innovative products and services and to adapt quickly to new opportunities (Cameron & Quinn, 2011). It has been found that the clan and hierarchy cultures are more common than the other types of OC in this model within the organization (Cameron & Quinn, 2011).

One of the most important concerns in the study of OC has been analyzing the connection between the OC and organizational performance and reciprocal effects on each other. As it has been mentioned earlier, one of the most remarkable study concerning this issue can be Denison's research (D. Denison et al., 2014; D. R. Denison & Mishra, 1995). In this research, it has been shown that organizations with high levels of involvement, consistency, adaptability, and mission can be categorized in the group of effective organizations (D. Denison et al., 2014). The framework of this concept has been applied by many OC researchers. For instance, Boyce et al (2015) performed the longitudinal research by Denison model at some American automobile dealerships to determine the theory that whether OC can impact performance during the time or vice versa and

over what time period can observe this much impact. In this study, it has been concluded that positively OC can cause a higher level of performance; however, they could not found any evidence for proving the impact of performance on OC. Moreover, their findings have shown that during the time between 1 and 3 years the OC-performance relationships can be observable clearly (Boyce et al., 2015).

In another study which has been researched through Schein's model at some Australian law firms indicating the layers of organizational culture supporting the innovation can cause innovative behaviors that lead to higher performance outcomes (Hogan & Coote, 2014). Furthermore, in this research has been shown that values supporting innovation cannot have any positive impact on performance directly, and those such values must present through a causal chain including norms, artifacts, and behaviors to lead any kind of implication on performance measures (Hogan & Coote, 2014).

This concern regarding OC- performance relationship has been studied through the CVF framework as well. One of the most current ones has been performed in more than 400 Korean firms through a macro-level longitudinal study to examine this relationship and quality of this during the time (Kim & Chang, 2019). This research was showed that it has not happened any significant changes in employees' perception of their organization's adhocracy, hierarchy, and market culture during time by considering some organizational characteristics such as industry, firm size and age; however, it was found a downward trend in clan culture. In addition, it was concluded that there was a positive relationship between adhocracy, clan, and market cultures with all the performance variables during the considering time, while it could not find any such relationship for Hierarchy culture (Kim & Chang, 2019). In another research through the CVF model at more than 100 small Tunisian firms, it was showed that there was not any direct impact on financial performance by the small firm's culture; however, some entrepreneurial orientation dimensions can play a mediating role to transfer the small firms to the sustained financial performance through opportunities created by OC (Khedhaouria et al., 2020). Moreover, it was found the positive effect of adhocracy and market cultures on entrepreneurial orientation dimensions of companies through which can result in pleasant financial performance (Khedhaouria et al., 2020).

To sum up it can be stated that there are different definitions and approaches for OC; however, most of organizational scholars are unanimous that the main content of culture consist of the values, beliefs, and assumptions which are set by the members of an organization and the way in which they convey the norms and shared meaning to others. Furthermore, many kinds of research

have been performed on the relationship between OC and organizational outcomes to determine how OC can have positive or any other impact on any key KPIs.

1.2. Review of literature on Lean system

The concepts of Lean comes from some innovations in Japanese manufacturers, especially Toyota Motor Corporation (Hines et al., 2004; Hines et al., 2020; Monden, 2011; Ohno, 1988; Shingo & Dillon, 1989). These innovations were due to the Japanese market conditions after second world war, such as just-in-time (JIT) production system, the Kanban system, kaizen method, and automated mistake proofing (Hines et al., 2004; Shah & Ward, 2007). Although Krafcik (1988) used the term 'lean' for the first time in his Master's degree thesis for calling these kinds of innovations (Danese et al., 2018; Krafcik, 1988; Shah & Ward, 2007), the term 'lean' was popularized by the breakthrough book "The Machine That Changed the World" in which indicated to the Toyota Production System (TPS) as a new manufacturing paradigm in contrast to Fordism and mass production so that this approach was named the "lean production" (Danese et al., 2018; Hines et al., 2020; Womack et al., 2007). From that time onwards, lean system is a significant area of academic research (Danese et al., 2018; Hines et al., 2020; Marodin & Saurin, 2013).

Over the years, the lean concept has expanded beyond the original application on the shop floor of vehicle manufacturers to various sectors and processes as a new managerial paradigm or as a best practice-based manufacturing strategy with remarkable results (Danese et al., 2018; Hines et al., 2004; Losonci & Demeter, 2013; Womack & Jones, 2003). Hines et al. (2004) considered four stages to provide a framework of lean concept evolutionary which adapted from the stages of organizational learning development (Hines et al., 2004). In the first or awareness period of lean evolutionary stages which happened during the years 1980 up to 1990, it was tool-focused such as JIT in the automotive industry. After 1990, the development of the lean concept was accelerated by Womack et al.' global benchmark project. In that time, it focused on cost, training and promotion, TQM and process reengineering in automotive industry component assembly. In the third stage between 1996 and 2000, Womack and Jones (2003) introduced five principles for lean with focus on customer value, and the value stream thinking was evolved and emphasized in all manufacturing industries. Finally, from 2000 onwards, it was stressed on value system, integrated to supply chain, integrated processes and strategy formation methods, and it was developed to not only all kinds of manufacturing industries with different volume, but also service sectors (Hines et al., 2004; Rother & Shook, 2003; Womack & Jones, 2003).

One of the most important stages in the development of the lean concept was the introduction of this concept with the fifth principles of lean thinking framework by Womack and Jones in 1996 (Hines et al., 2004). These principles with focus on value consist of specifying value from the standpoint of the end customer, managing value stream by identifying all the steps and eliminating non value steps, making the value-creating steps as a smooth flow toward the customer, setting pull system to let customers pull value from the next upstream activity, and finally going to the state of perfection through creating prefect value by eliminating all kinds of wastes (see fig.4) (Womack & Jones, 2003).

Figure 4. **Lean thinking principles.**
Source: Womack & Jones, 2003.

Regarding lean thinking model and the criticisms that have been made to this model during lean evolution, Hines et al. (2004) concluded that the concept of Lean could be modeled on two strategic and operational levels (Hines et al., 2004). They suggested to use lean thinking principles in strategic level and lean production methods in operational level (see fig.5). They claimed that it is important to consider these two levels for lean concept in order to apply the right tools and strategies to provide customer value (Hines et al., 2004). Furthermore, they concluded that the evolution of the lean concept has been at its strategic level, or the principles of lean thinking, and basis of these principles can extend to all types of businesses without the limitations of lean production at operational levels (Hines et al., 2004).

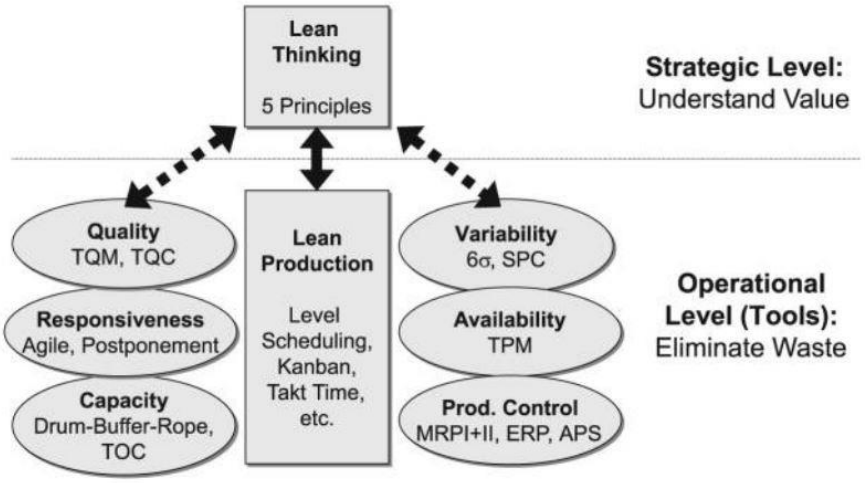

Figure 5. **Lean framework**.

Source: Hines et al., 2004.

Today, the term lean is considered as an improvement strategy with various methods and techniques such as just-in-time, quality systems, team working, kaizen, cellular manufacturing, supplier management, Six Sigma, Total Productive Maintenance (TPM) (Netland, 2016; Schonberger, 2008; Shah & Ward, 2003). It can be stated that fundamental benefits of lean strategy is the elimination of waste (muda in Japanese) in order to produce and deliver quality products or services in due time and with optimal costs (Danese et al., 2018; Shah & Ward, 2003). Considering this improvement strategy and regarding to recent economic downturn, intense competition and more open global economy during these years, companies have been looking for ways such as lean to increase productivity and reduce organization costs. For these reasons it can be seen the increasing trend of significant lean transformations efforts for improving the competitiveness of firms globally (Holweg, 2007; Losonci & Demeter, 2013; Marodin & Saurin, 2013; Netland, 2016; Womack et al., 2007).

Lean management (LM) is consist of philosophical or strategic perspective (Hines et al., 2004; Losonci & Demeter, 2013; Shah & Ward, 2007; Spear & Bowen, 1999; Womack & Jones, 2003), and practical perspective of a set of management practices (Hines et al., 2004; Li et al., 2005; Losonci & Demeter, 2013; Shah & Ward, 2003, 2007). Regarding to practical perspective, there is not any specific agreement among scholars on quality and quantity of lean practices (Holweg, 2007; Losonci & Demeter, 2013). In one of studies which was performed through analyzing 16 articles, it was concluded that the most frequent practices are included: continuous improvement programs, cross-functional work force, JIT/continuous flow production, lot size reductions, pull system/kanban, quick changeover techniques, preventive maintenance, and total quality

management (Shah & Ward, 2003). Further, Shah and Ward (2007) introduced 48 practices into 10 factors and 3 main constructs for defining lean production (see fig. 6) (Shah & Ward, 2007). It was defined lean production as an integrated socio-technical system so that its factors and practices cannot be considered separately for lean concept, but together they form a lean production system with synergetic effects (Losonci & Demeter, 2013; Shah & Ward, 2007). Although by this study, they provided a measurement instrument for practical aspects of Lean concepts, they mentioned that it is multifaceted concept and it is difficult to measure its philosophical dimensions (Shah & Ward, 2007).

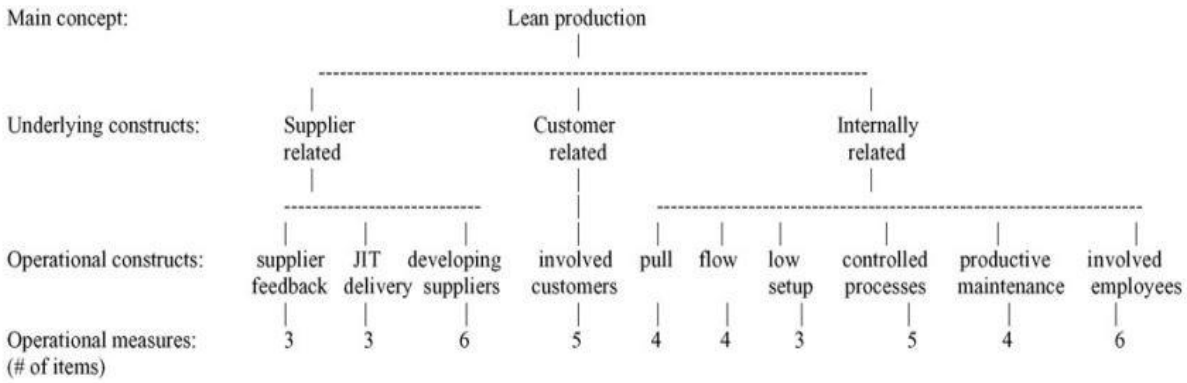

Figure 6. **Conceptual and empirical mapping of lean production.**
Source: Shah & Ward, 2007.

Lean system implementation and maintaining of this system can be consider one of the major concerns of scholars in this field. It has been observed that lean implementation processes could achieve remarkable results in the early years, but the trend of improvements dropped in the long term in many cases (Dombrowski & Mielke, 2013; Sisson & Elshennawy, 2015). That is why numerous lean implementation frameworks have been presented within the last twenty years (AlManei et al., 2017; Anand & Kodali, 2010; Chay et al., 2015). Some authors believe that the main reason of failure to implement lean projects has been the sole focus on lean methods and Key factor for the sustainable success are the employees and leaders (Dombrowski & Mielke, 2013; Meier & Liker, 2005; Orr, 2005). In other words, the main challenge is the change in behavior and mentality of employees and leaders (Mann, 2009). One of the prominent frameworks in line with this concern can be considered the 4Ps model of Toyota way (see fig. 7). This model has been illustrated the 14 principals into 4 P stand for philosophy, processes, people and partners, and problem-solving (Liker, 2004). The first P, philosophy, involves focusing on creating value for all beneficiaries and being responsible for long-term growth with business partners. In addition, it recommends to make decisions with long term attitude in any circumstances. Second section

involves creating process without any waste by using some methods such as continuous flow, pull system, level out the workload, Standardization and etc. People and partners section concerns developing staff in all organizational levels in line with OC and lean philosophy, and also devolving partners and suppliers with long term attitude. And the last part refers to some principles regarding solving problems by analyzing all aspects and thoroughly understand the situation and making decisions by consensus through communicating within team. Furthermore, it advises to be learning organization through, e.g., continuous improvement, protecting the organizational knowledge base, applying five-why analysis, using policy deployment approach, and following PDCA at all levels (Liker, 2004).

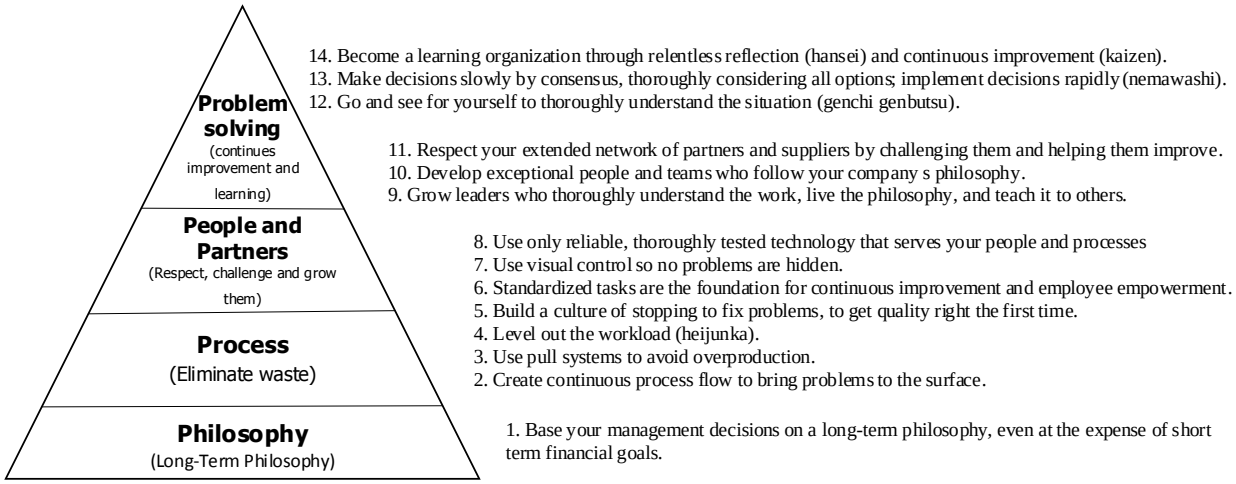

Figure 7. **4P model of the Toyota Way.**
Source: Liker, 2004.

Many authors mentioned about the importance of leadership in lean implementation (Dombrowski & Mielke, 2013, 2014; Halling & Renström, 2014; Keough, 2012; Mann, 2009; Orr, 2005; Saad et al., 2006; Tortorella et al., 2020; Trenkner, 2016). Therefore, some scholars have tried to solve lean implementation issues by presenting lean leadership models. For instance, Dombrowski and Mielke (2013) presented lean leadership model inspired by Liker's 4P model (Dombrowski & Mielke, 2013, 2014). They believed that the continuous improvement is the main element of lean leadership so that lean leadership can be the missing link between lean tools and the learning and continuous improvement (Dombrowski & Mielke, 2013, 2014). They identified five principles for their models including Improvement culture, Self-development, Qualification, Gemba, and Hoshin Kanri, and defined lean leadership as a methodical system for the sustainable

implementation and continuous improvement of lean production system so that subsumes the cooperation of employees and leaders for perfection (Dombrowski & Mielke, 2013).

The lean strategy like any other productivity improvement initiative has been facing many challenges during implementation in originations. That is why many scholars have studied about critical success factors for implementing lean (Knol et al., 2018; Netland, 2016; Saad et al., 2006; Schonberger, 2008; Sim & Rogers, 2009; Yadav et al., 2019). For instance, in one study it was found four main factors that are critical for the implementation of lean manufacturing within SMEs (Saad et al., 2006). Those consist of leadership and management, finance, skills and expertise, and organizational culture. In another study which was conducted through, 22 CSFs reported across 14 structured reviews of the literature on TQM, Six Sigma, TPM, JIT and lean, the author concluded that three key CSFs for lean implementation are 'management commitment and involvement', 'training and education' and 'employee participation and empowerment' (Netland, 2016). Furthermore, findings of this study indicated that a particular national culture cannot changes top-ten CSFs; However, it has suggested to apply benchmarking tools as success factor in organizations which are in countries characterised by a collectivist culture (Netland, 2016). Concerning to same issue in multinational corporations, some reserchers have mentioned about various contextual conditions which can impact on lean implementation. For instance, Boscari et al. (2016) stated that international teamwork can be an efficient solution to transfer lean Knowledge and develop the lean program in foreign subsidiaries, but this kind of solution must take into consideration of different contextual conditions in subsidiaries. Therefore, they have stressed to apply different types of international teamwork in terms of organization maturity and strength of headquarters-subsidiary relations (Boscari et al., 2016).

Although it can find noticeable studies which have mentioned about lean system positively with remarkable results, there have been some numbers of gaps to criticize lean (Hines et al., 2020). For instance, some scholors critisied for lack of a standard implementation process, or some other authors have stated criticized about the transferability and sustainability of Lean ,and so on (Hines et al., 2020). It has been stated that these criticisms and the mentioned gaps come from the results-oriented and tools focused approach during the process of lean implementation (Hines et al., 2020). It has been explained the reason for successful lean implementation in some companies by elaborating three stages of lean evolution as follows: tool-based change, systems-based change, and cultural-based change (Hines et al., 2020). Furthermore, they introduced their Lean maturity framework based on these three stages of lean evolution (see fig. 8). The third stage is the most complicated stage where the central feature is the development of a culture of improvement. In this stage, organizations use an annual learning cycle based on PDCA cycle to go through four

systems as followed: Behavioural and Strategy Deployment system, Continuous Improvement system, Leadership Standard Work, and Learning & Development system (Hines et al., 2020).

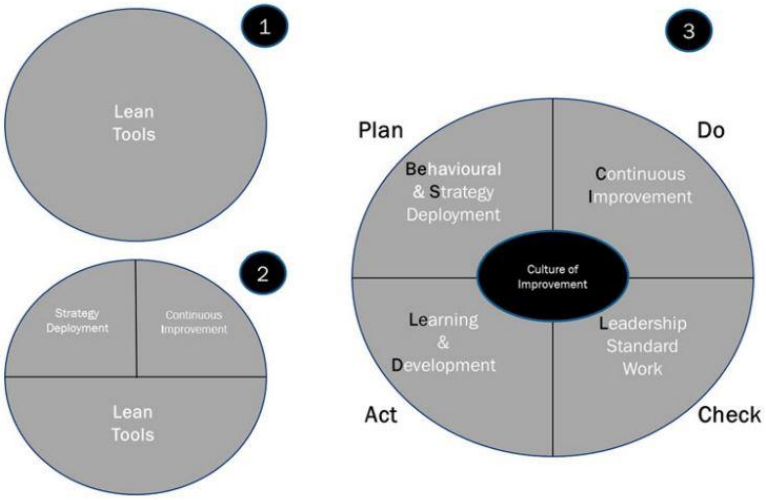

Figure 8. **Lean maturity framework.**
Source: Hines et al, 2020.

To sum up, it can be stated that the lean concept has expanded from the original application in vehicle manufacturers to various sectors even service-based organization as an innovative strategy over the years. It has been mentioned different perspectives such as philosophical, strategic, and practical for Lean definition by lean scholars. In spite of the willingness of organizations to embrace lean principles in their organization, this strategy has been facing many challenges and barriers during implementation and maintaining in originations. That is why it can be found many frameworks for implementation Lean system. It can be concluded that the main reason of failure to implement lean projects is tools focused approach during the process of lean implementation.

1.3.Relationships between organizational culture and lean system

The idea of corporate culture can make clear some contexts which cause the differences among successful and unsuccessful organizations (Lim, 1995; Schein, 2010). It has been indicated the strong impacts of OC on capability and effectiveness of organizations by many organizational scholars (Cameron & Quinn, 2011; D. Denison et al., 2014; D. R. Denison, 1990; D. R. Denison & Mishra, 1995; Lim, 1995; Pinho et al., 2014; Prajogo & McDermott, 2011; Van den Berg & Wilderom, 2004). It has been insisted that it can be impossible to sustain any kinds of improvement in organizational performance without change of culture (Cameron & Quinn, 2011). In other

words, by neglect of OC, all kinds of improvement strategies such as TQM, downsizing, reengineering and so on are doomed unless OC modification is defined a critical step for implementing these kinds of improvement (Cameron & Quinn, 2011).

The remarkable achievements of Toyota and other organizations by implementing lean system as an improvement stratgy has pushed many companies toward following lean princeles with strong motivation golabaly; however, many such these efforts have failed without any expected results (Bortolotti et al., 2015; Liker & Rother, 2011). Within the last two decades, different aspects of OC issues have been cited as one of the main reason for lean success or failure by many scholars (Bortolotti et al., 2015; Erthal & Marques, 2018; Hernandez-Matias et al., 2019; Lacksonen et al., 2010; Liker, 2004; Liker & Rother, 2011; Pakdil & Leonard, 2015; Ramarapu et al., 1995; Rother, 2009; Sebtaoui et al., 2020; Spear & Bowen, 1999). It has been distinguished lean practices by naming 'soft' innovations from 'hard' innovations, and classified corporate culture as 'soft' innovations in the success story of lean firms (Boscari et al., 2016; Danese et al., 2018; Hernandez-Matias et al., 2019).

To understand how specific societal cultural dimensions are in relation with the success of Lean system in the organizations, it was used Liker's and Hofstede models by Lacksonen et al (2010) and concluded that the first principle of lean - long-term philosophy - has a positive correlation with the cultural dimension of long-term orientation (Lacksonen et al., 2010). They stated that by some methods in lean such as standardized tasks, level workload, stopping to fix problems once they occur, and continuous improvement by all employees can classify lean processes in a low power-distance index (PDI) culture (Lacksonen et al., 2010). Furthermore, they mentioned that it is necessary to have group cooperation to perform all these kind of methods, therefore lean processes can apply better in collectivism culture. In addition, lean processes work well in a culture of high uncertainty avoidance, because of keep trying to minimize variability within the processes. People as the third lean principle was considered with negative correlation with the power distance index and Individualism index. In lean companies, managers encourage staff to participate in a quality circle or problem solving session, and train them to be creative and efficient for finding solutions. In addition, in Lean system, people are conducted and trained to act in some groups and teams, and also this manner is expanded to value stream out of the organization. In lean organizations, staff are trained, managed, and developed by long term perspective. And this strategy is performed in relation to suppliers and other partners through long-term contracts as well. Finally, the authors concluded that problem solving as the forth lean principle is more easily implemented in low power distance index and low individualism culture. Additionally, because of some characteristics such as seeking the best solution, continuous effort, data collection, and quick

implementation of decisions in a lean system, this principle has been considered with features of masculine culture. The main goal of the problem solving culture is the reduction of uncertainties and manage changes and conflicts which is why it has been considered with a strong correlation to uncertainty avoidance index. In this study lean problem solving was determined with a long term oriented approach by mentioning some methods such as root-cause analysis, the five Whys technique and learning organization (Lacksonen et al., 2010). The authors concluded that for effective lean implementation in a country needs to have knowledge about unique cultural features of that area and challenging lean principles with such features (Lacksonen et al., 2010).

Some previous studies have mentioned cultural issues as barriers and challenges through the lean transformation. According to Nordin et al. (2012), the main reason of all difficulties is the necessity of change in many aspects and stages within lean transformation in organizations (Nordin et al., 2012). It was stated that for lean transformation, staff needs to understand what the lean is and what organizational change management principles are (Nordin et al., 2012). It was investigated previous studies about organizational changes required in lean transformation, and classified organizational change into four categories including changes in process, changes in function, coordination and control, changes in values and human behavior, and changes in power within the organization (Nordin et al., 2012). Moreover, by study the lean critical factors literature, it was concluded critical success factors for lean transformation are consist of effective leadership, comprehensive change plan, team development, communication, training, change agent, culture readiness, employee autonomy, lean change evaluation, worker empowerment, and rewarding system (Nordin et al., 2012). Further, it was proposed a framework for organizational change management in lean implementation. The framework consists of two cycles, namely first, readiness for change, and second, the change implementation (Nordin et al., 2012). The authors asserted that for being ready to change, creating a sense of the necessity to change, having a clear direction and strong leadership and change agent team are vital for organisation. After preparing the environment to change, the second cycle of the framework was proposed to implement the lean tools and techniques or processes. In this stage, effective communication, education and training, and system and control have been considered critical factors for lean success by the authors (Nordin et al., 2012).

Another debate among researchers is the relationships between OC, some quality initiatives such as TQM and Lean, and organizational performance. For instance, this concern has been studied through the CVF model by Hardcopf and Shah (2014). It was used the database collected from 2002-2006 and measures of Shah and Ward (2007) model in this study (Hardcopf & Shah, 2014). First, it was predicted the neutral relationship between clan and market cultures, Lean, and

operational performance. And also, it was predicted the positive impact of adhocracy culture and negative impact of hierarchy culture on Lean, and operational performance. However, it was observed the neutral impact of the hierarchy culture and the negative impact of market culture. In addition, the neutral impact of clan culture was proved. Finally, it was found the partial positive impact of adhocracy culture on Lean, and operational performance (Hardcopf & Shah, 2014). They also posited that a lean firm has ambidextrous culture mixed up clan and adhocracy culture characteristics, and therefore it can impact positively on Lean and operational performance; however, it was found the neutral relationships among the study variables. It was concluded the adhocracy culture is the most supportive OC type for the Lean system, and market culture has an adverse effect on this (Hardcopf & Shah, 2014).

The same framework (CVF) was used to study cultural aspects in the process of lean implementation by Pakdil and Leonard (2015). It was considered some methods as dimensions for lean process including employee involvement, creativity, problem-solving processes, decentralization, control and standardization, efficiency, productivity, and continuous quality improvement in this study (Pakdil & Leonard, 2015). After inquiring characteristics of each quadrant in CVF and dimensions of lean process, it was proposed that a firm characterized by an emphasis on clan culture will have more effective lean processes, in terms of employee involvement and teamwork, compared with firms that are characterized by one of the other three quadrants, and on adhocracy culture a firm will have more effective lean processes, in terms of creativity, problem-solving processes, and decentralization, compared with firms that are characterized by one of the other three quadrants (Pakdil & Leonard, 2015). In a same way, on hierarchical culture a firm will be more capable at of control, standardization, and predictable performance outcome techniques, compared with firms that are characterized by one of the other three quadrants. Also it was proposed that in a firm with market culture, there will be more effective lean processes, in terms of efficiency, productivity, and continuous quality improvement, compared with firms that are characterized by one of the other three quadrants (Pakdil & Leonard, 2015). And in the best style, it was hypothesized that there will be the most effective lean processes in an organization with a balanced culture in comparison with organization that are characterized by a single quadrant. It was illustrated the propositions by the figure 9 (Pakdil & Leonard, 2015).

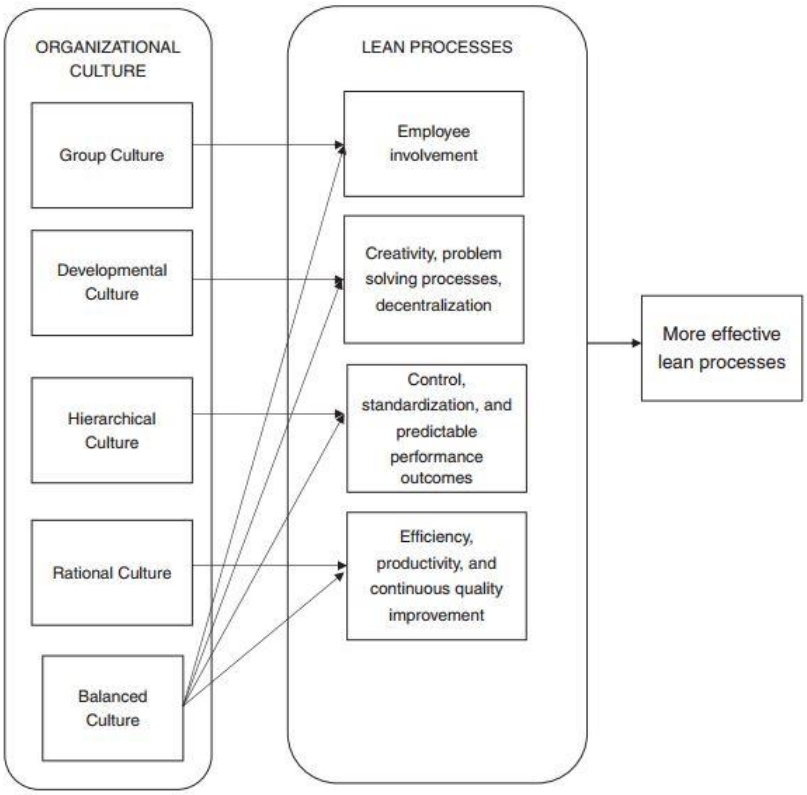

Figure 9. **The proposed relationships between OC culture types and Lean processes.** Source: Pakdil & Leonard, 2015.

Further, Pakdil, and Leonard (2017) classified five elements of lean prosses by Liker 4P model and studied the relationship between societal culture dimentions and lean processes by Hofstede model (Pakdil & Leonard, 2017). It was posited that it is likely to be a positive relation between individualism society and high level of lean process adoption, regarding individual employee involvement, individual creativity, and firm efficiency (Pakdil & Leonard, 2017). And it is likely to be a positive relation between collectivist society and high level of lean process adoption, regarding team employee involvement, team creativity, control and standardization, and long term philosophy. Concerning uncertainty avoidance, it was proposed that there can be a positive relationship between high uncertainty avoidance and high level of lean process adoption, regarding control and standardization, efficiency, and long term philosophy. And there can be a positive relationship between low uncertainty avoidance and high level of lean process adoption, regarding employee involvement, and creativity (Pakdil & Leonard, 2017). Concerning power distance, it was proposed that there will be a positive relation between high power distances and high level of lean process adoption, regarding control and standardization, and efficiency. And there will be a positive relation between low power distances and high level of lean process adoption, regarding employee involvement, creativity, and long term philosophy (Pakdil & Leonard, 2017).

Concerning time orientation, it was posited that there will be a positive relation between long term orientation and high level of lean process adoption, regarding all of the lean processes elements. And there will be a positive relation between short term orientation and high level of lean process adoption, regarding control, standardization, and efficiency (Pakdil & Leonard, 2017). Concerning masculinity and femininity, it was posited that there will be a positive relation between feminist society and high level of lean process adoption, regarding employee involvement, creativity, and long term philosophy. And there will be a positive relation between masculinity society and high level of lean process adoption, regarding control and standardization, and efficiency (Pakdil & Leonard, 2017).

In another hypothetical study, it was explored the OC –Lean relationship and ideal profile for Lean implementation based on the CVF and 4P model of Liker by Paro & Gerolamo (2015). It was researched by comparing the characteristics of each OC types with the main aspects of each Toyota principle reflected in the 4P model (Paro & Gerolamo, 2015). It was concluded that mostly the hierarchy Culture profile can be more compatible with lean principles with 46% conformity compared to other OC types, and in the opposite, they are less in line with each other once it comes to adhocracy Culture with 4% conformity. Moreover, as it was resulted the clan and market culture may have a moderate impact on Lean success implementation with 25% conformity (Paro & Gerolamo, 2015).

In one of the first empirical attempts among OC-Lean researches, it was studied the relationship between four OC types based on CVF and three lean Six Sigma implementation components including management involvement and support, use of lean Six Sigma methods, and lean Six Sigma infrastructure in some American hospitals by Knapp (2015). It was argued that there may be any significant connection between the clan and adhocracy cultural types and management involvement and support, and between hierarchical cultural types and lean Six Sigma infrastructure, and also between market cultural types and use of lean Six Sigma methods (Knapp, 2015). Based on the research questions, it was found a positive relationship between the first key components - management involvement and support – and clan and adhocracy cultures (Knapp, 2015). However, it could not find any relationship between the hierarchical culture and lean Six Sigma infrastructure, and any relationship between the market culture and lean Six Sigma methods. It was concluded that if hospital managers follow the group and developmental cultures approach, the desired initiatives are more likely to succeed (Knapp, 2015).

Some authors have argued that there may be the specific OC in successful lean organizations compered to unsuccessful plants in implementation lean management system. For example, Bortolotti et al (2015) studied to understand what can be the optimal OC profile that “best fits”

with Lean system by investigating success and failure lean journey of companies (Bortolotti et al., 2015). In their study, it was used the GLOBE model of OC and the High Performance Manufacturing (HPM) database. It was classified case studies into four categories regarding to level of Lean implementation and high or low performance, namely HLHPs, HLLPs, LLHPs, and LLLPs (Bortolotti et al., 2015). Their study results indicated that, among the eight OC dimensions, the successful lean plants (HLHPs) compared to unsuccessful lean plants (HLLPs) were characterized by higher institutional collectivism, future orientation, and humane orientation and lower assertiveness. It was not observed any significant differences between these two categories regarding to dimensions of power distance, in-group collectivism, performance orientation, and uncertainty avoidance; however, by compering lean and non-lean plants, except future orientation, it was found significant differences related to in-group collectivism and uncertainty avoidance as well (Bortolotti et al., 2015). By comparing high-performer lean plants (HLHPs) and high performer non-lean plants (LLHPs), it was concluded that institutional collectivism, future orientation, humane orientation are common organizational features among them (Bortolotti et al., 2015). It was showed that low assertiveness is only organizational features that distinguishes successful lean companies with other companies. It was mentioned that most of OC-Lean studies has not defined any specific OC profile to guarantee the successful lean system implementation (Bortolotti et al., 2015).

In another empirical study, it was endeavored to find any evidence about the OC effects on Lean by shop floor staffs' perspective in one firm as a case study located in Hungary by Losonci et al. (2017). The OCAI based on Cameron and Quinn’s s (2011) model and the lean assessment model based on Pakdil and Leonard's (2014) measures was applied in this research (Losonci et al., 2017). It was observed that only flexible OC types including adhocracy and clan have a positive impact on the information flows and work organization practices out of six Lean items in the case study during the lean transformation (Losonci et al., 2017). In this study also, it was examined the impact on the Lean practices in the subcultures level in which observed three influential OC types including hierarchy, adhocracy, and clan impacting four Lean practices based on the different subcultures. It was concluded the weak impact of OC on the Lean implemetation (Losonci et al., 2017).

In lean literature can be found the topic which is called “lean culture”. Some researchers have been mentioning about the organizational culture of Toyota as the main reason of successful and sustainable performance of this lean organization (Liker, 2004; Mann, 2009, 2014; Osono et al., 2008; Spear & Bowen, 1999; Wilson, 2010). Therefore, some authors have attempted to investigate the culture of successful lean organization and extract a model as a lean OC profile.

For instance, Taherimashhadi and Ribas (2018) studied the relationship between NC, OC, and Lean and tried to theorize a lean culture model (Taherimashhadi & Ribas, 2018). This study has been the first attempt to integrate NC and OC related to Lean, and authors hypothesized that national culture and organizational culture have a significant effect on successful Lean implementation. In this research, the lean culture was modeled by the adoption of Hofstede (1984), GLOBE (House et al., 2004), and Trompenaars & Hampden-Turner (1997) models and was validated through some case studies in different countries (Taherimashhadi & Ribas, 2018). The proposed model was defined with six dimensions including authority distribution, sense of belonging to the organization, the courage to accept changes, performance orientation, time perspective orientation, and lively spirit orientation (see fig. 10). As it is illustrated, it was determined some soft practices regarding each dimension as a guideline for organizations to align their OC with the lean culture. The purpose of modeling was to create a framework for measuring and evaluating OC with compered to lean culture, and to identify and manage OC weaknesses before implementing the principles of Lean in order to successfully implement a Lean system. After analyzing case studies in three countries by the research model, it was concluded that the effects of both NC and OC should be taken into account in order to achieve success in implementation Lean system successfully (Taherimashhadi & Ribas, 2018).

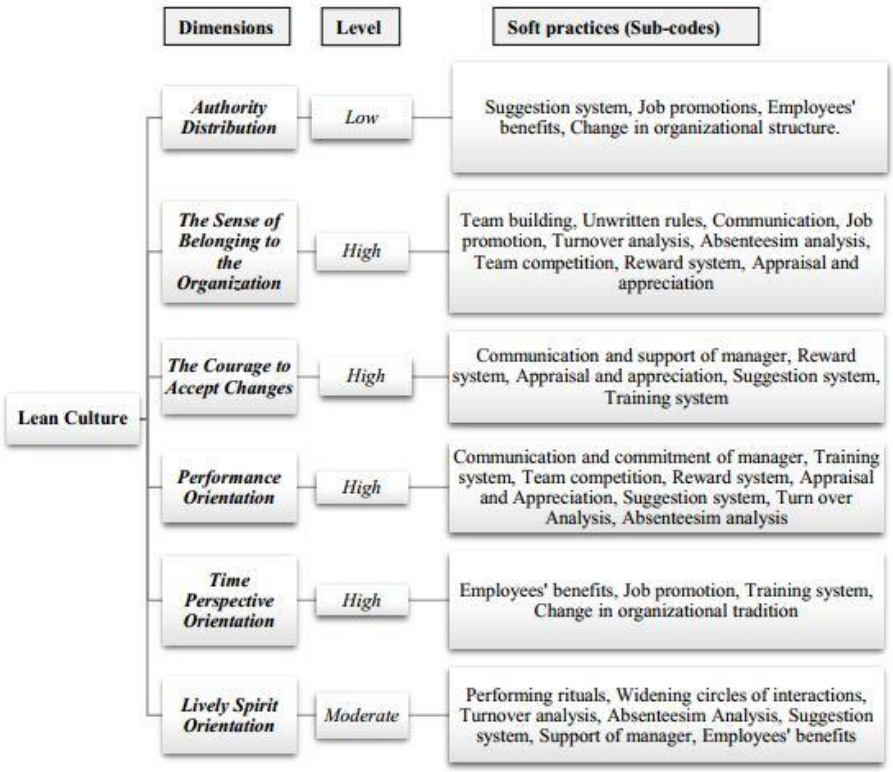

Figure 10. **Lean culture model.**

Source: Taherimashhadi & Ribas., 2018.

The evolving role of culture in lean field during the two last decades has been investigated with a systematic literature review by Erthal and Marques (2018). In their research, lean studies was classified into four streams, including lean transplantation, lean implementation, lean continuity, and lean service, and then it was used Hofstede's framework to find some influential dimensions of NC and OC in lean organizations by investigating 65 articles (Erthal & Marques, 2018). It was concluded that high uncertainty avoidance, high collectivism, and long-term orientation are synchronized with principles of lean among dimensions of NC (Erthal & Marques, 2018). In addition, it was found confliction and paradox for another two dimensions of NC among scholars, including low power distance and low masculinity. In the OC level, it was found that there is a significant relationship between some dimensions such as tight control, employee-oriented, professional and open system approaches with Lean system, and there is not any consensus for the dimensions of process vs. result orientation and normative vs. pragmatic approach among scholars (Erthal & Marques, 2018). Furthermore, it was found that there has not been any study which has investigated the interactions between NC and OC in the lean field so far. It was asserted that having cultural similarities with Japan cannot be a guaranty for successful lean implementation in organizations which are placed to these kinds of countries, and conversely. It should be taken into account that which NC dimensions can support lean principles and which can be barrier; however, most importantly is that OC is derived from managerial attitude and can have a positive and balancing impact on lean adoption regarding some negative effects of NC dimensions (Erthal & Marques, 2018).

It has been studied the OC-Lean relationship with considering leadership style as one of the socio-cultural aspects by the Tortorella et al (2020). It was surveyed through the CVF model by asking some leaders from Brazilian manufacturing companies implementing lean manufacturing (Tortorella et al., 2020). It was tried to find out what the best compound of leadership styles and OC to lead a successful Lean system. It was observed the market culture as the most mentioned OC types and the hierarchical culture as the least in their sample. Also, it was observed that where clan culture dominates facilitating leadership style is common in firms with a high level of Lean implementation compared to other firms (Tortorella et al., 2020). In firms characterized by adhocracy culture, it was shown that the prevalent leadership style is a directing behavior in a low level of Lean implementation firms compared to others. In firms characterized by market culture, it was found the coaching leadership style as a preferred style among managers in the high level of Lean implementation firms compared to others; however, in a hierarchical culture the coaching leadership style was more frequent in the low level of Lean implementation firms compared to others (Tortorella et al., 2020). They concluded that for organizations facing the lean

transformation it is better to identify the prevailed OC type and then apply proper leadership style. In addition, Since the leadership behavior changes are much available than changes in OC, it was recommended that it is more reasonable to adopt the proper leadership styles with OC type of company to achieve the best result in Lean implementation (Tortorella et al., 2020).

The summary of studies discussed above has been provided in Table 1 as per below:

Table 1

Summary of the OC - Lean studies reviewed in the literature

Authors	OC / Lean framwork	Objectives	Findings
Lacksonen et al (2010)	NC Hofstede model (1980) / Liker 4P Model (2004)	Understand how specific societal cultural variations are related to the success and effectiveness of lean manufacturing philosophy in the organizations.	- Concluded that lean process works well in low power distance, collectivism, masculine, high uncertainty avoidance, and Long-term orientation culture. - Advised for effective lean implementation in a country needs to have knowledge about unique cultural features of that area and challenging lean principles with such features.
Nordin et al. (2012)	-	- Literature review for lean manufacturing approach in the context of organizational change management. - Categorized the required organizational changes in a lean transformation.	- Concluded critical success factors for lean transformation are consist of effective leadership, comprehensive change plan, team development, communication, training, change agent, culture readiness, employee autonomy, lean change evaluation, worker empowerment, and rewarding system. - Proposed a framework for organizational change management in lean implementation.
Hardcopf and Shah, (2014)	CVF (based on Cameron & Quinn model) / Shah & Ward model (2007)	Examine the impact of OC on the relationship between lean and performance.	- Observed neutral impact of hierarchy culture and clan culture. - Observed negative impact of market culture. - Found the partial positive impact of adhocracy culture. - Found the neutral relationship among ambidextrous culture mixed up clan and adhocracy culture characteristics and Lean, and operational performance. - Concluded the adhocracy culture is the most supportive OC type for the Lean system, and market culture has an adverse effect on this.

Source: Author

Continuation of Table 1

Summary of the OC - Lean studies reviewed in the literature

Pakdil and Leonard, (2015)	CVF (based on Cameron & Quinn model)	Conceptualization of the correlation between different OC types and the effectiveness of lean processes.	- Proposed a clan cultural firm has more effective lean processes, in terms of employee involvement and teamwork, - Proposed an adhocracy cultural firm has more effective lean processes, in terms of creativity, problem-solving processes, and decentralization, - Proposed a hierarchical cultural firm has more effective lean processes, in terms of control, standardization, and predictable performance outcome techniques, - Proposed a market cultural firm has more effective lean processes, in terms of efficiency, productivity, and continuous quality improvement, - Proposed there will be the most effective lean processes in an organization with a balanced culture.
Paro & Gerolamo (2015)	CVF (based on Cameron & Quinn model) / Liker 4P Model (2004)	Explore an ideal Lean culture based on comparing the characteristics of each OC types with the main aspects of each Toyota principle.	Concluded the hierarchy Culture profile can be more compatible with lean principles compared to other OC types, and in the opposite point is adhocracy Culture.
Knapp, (2015)	CVF (based on Cameron & Quinn model) / lean six sigam green & black belt	Examine the relationship between four OC types and three lean Six Sigma implementation components	Results showed if hospital managers follow the clan and adhocracy cultures approach, the desired initiatives are more likely to succeed.
Bortolotti et al, 2015	GLOBE model (2004)	Explore the OC profile features of a successful lean firm compared to other kinds of firms.	- Observed a higher institutional collectivism, future orientation, a humane orientation, and a lower level of assertiveness compering the HLHPs & HLLPs. - Observed a high level of institutional collectivism, future orientation, and humane orientation are common features of the HLHPs & LLHPs. - Observed low assertiveness as the only organizational features that distinguishes successful lean companies with other companies.
Pakdil, and Leonard, (2017)	NC Hofstede model (2001) / Liker 4P Model (2004)	Study of the interconnection of different societal culture and lean processes.	- Posited a positive relation between individualism society and high level of lean process related to (1), (3), and (6) - Posited a positive relation between collectivist society and high level of lean process related to (2), (4), (5), and (7) - Posited a positive relationship between high uncertainty avoidance and high level of lean process related to (5), (6), and (7) - Posited a positive relationship between low uncertainty avoidance and high level of lean process related to (1), (2), and (3).

Source: Author

Continuation of Table 1

Summary of the OC - Lean studies reviewed in the literature

Pakdil, and Leonard, (2017)	NC Hofstede model (2001) / Liker 4P Model (2004)	Study of the interconnection of different societal culture and lean processes consist of (1) employee involvement at the individual and (2) team levels; (3) Creativity, problem-solving processes, and decentralization at the individual and (4) team levels; (5) Control, standardization and predictable performance outcomes; (6) Efficiency, productivity and continuous quality improvement; and (7) Long-term philosophy.	- Posited a positive relation between high power distances and high level of lean process related to (5) and (6). - Posited a positive relation between low power distances and high level of lean process related to (1), (2), and (7). - Posited a positive relation between long term orientation and high level of lean process related to (1), (2), (3), (4), (5), (6) and (7). - Posited a positive relation between short term orientation and high level of lean process related to (5) and (6). - Posited a positive relation between feminist society and high level of lean process related to (1), (2), (3), and (7). - Posited a positive relation between masculinity society and high level of lean process related to (5) and (6).
Losonci et al., (2017)	CVF (based on Cameron & Quinn model) / Pakdil & Leonard's model(2014)	Examine the impact of OC and subcultures on lean production (LP) practices by shop floor staffs' perspective.	- Observed the adhocracy and clan culture have a positive impact on the information flows and work organization practices out of six of Lean items in the case study. - Concluded the weak impact of OC on the Lean implementation.
Taherimashhadi and Ribas, (2018)	NC Hofstede (1984), GLOBE (2004), and Trompenaars & Hampden-Turner (1997)models	Propose a framework for measuring and evaluating OC by compering to lean culture, and to identify and manage OC weaknesses before implementing the principles of LM.	- Defined a model with six dimensions by integrating the NC with OC. - Determined some soft practices regarding each dimension as a guideline for organizations to align their OC with the lean culture.
Erthal and Marques, (2018)	NC and OC Hofstede model (1991) / four identified lean streams	Review of the over two decades of lean literature according to the NC and OC and maps which cultural dimensions foster or hinder lean implementation.	- In terms of NC, concluded that high uncertainty avoidance, high collectivism, and long-term orientation are synchronized with principles of Lean. - In terms of OC, observed that tight control, employee-oriented, professional, and open system approaches seem to align with lean, though found lack of consensus.
Tortorella et al, (2020)	CVF (based on Cameron & Quinn model)	Identify the combination of OC profiles and leadership styles that best support companies implementing Lean practices.	- Observed the market culture as the most mentioned OC types and the hierarchical culture as the least in their sample. - concluded that for organizations facing the lean transformation it is better to identify the prevailed OC type and then apply proper leadership style. - Recommended adopting the proper leadership styles with the OC type of company to achieve the best result in Lean implementation.

Source: Author

To sum up, it can be stated that it is impossible to sustain any kinds of improvement in organizational performance without change of culture. According to studies, most of CSFs and barriers of Lean implementation related to human-related issues and or cultural issues in organizations. It has been clustered lean innovations into soft and hard categories, and classified corporate culture as 'soft' innovations. That is why it can be found noticeable studies related to the relationship between OC and Lean recent years. Some scholars tried to understand how specific OC dimensions are in relation with the success of Lean in the organizations, and some others have argued that there may be the specific OC in successful lean organizations compered to unsuccessful plants in implementation lean system. Because of the strong role of cultural issues in lean implementation projects, some scientists have tried to define and theorize the term lean culture. Moreover, it has been mentioned that NC has impact on Lean in different ways. Authors have mentioned that having cultural similarities with Japan cannot be a guaranty for successful Lean implementation in organizations. There has not been enough studies which has investigated the interactions between NC and OC in the lean field so far. There may be some differences between OC and Lean relationship regarding different nationalities such as Lithuanian and Iranian. It can be interesting subject to figure out how OC in different countries can have impact on lean adoption regarding some negative or positive effects of NC dimensions.

2. RESEARCH DESIGN

2.1 Research questions & Research model

Based on the literature review, the following questions are considered in this study:

RQ1: Is there any significant relationship between OC and the lean system?

RQ2: Which kinds of OC type can impact upon the implementation of the lean system positively?

RQ3: How are the impacts of OC types on the implementation of the Lean system comparing the Lithuanian and Iranian companies with respect to their national cultures?

RQ4: What can be recommendations to align OC for implementing and sustaining the lean system in organization?

Based on the research questions and the information gathered throughout the literature review, the following conceptual model (see fig. 11) and measurement model (see fig. 12) of the research have been constructed:

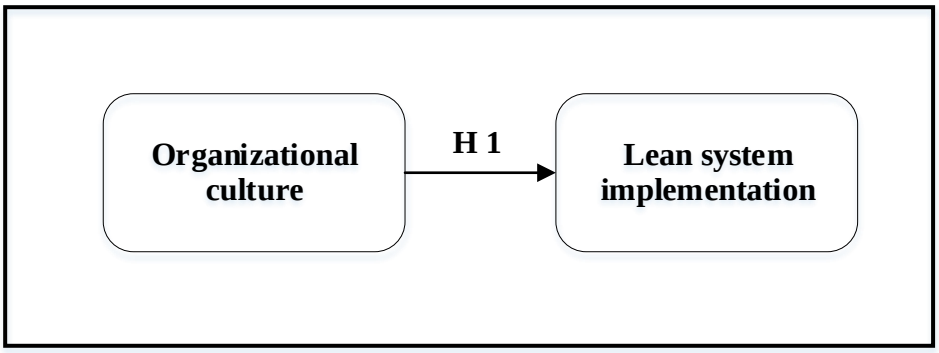

Figure 11. **Conceptual research model.**

Source: author.

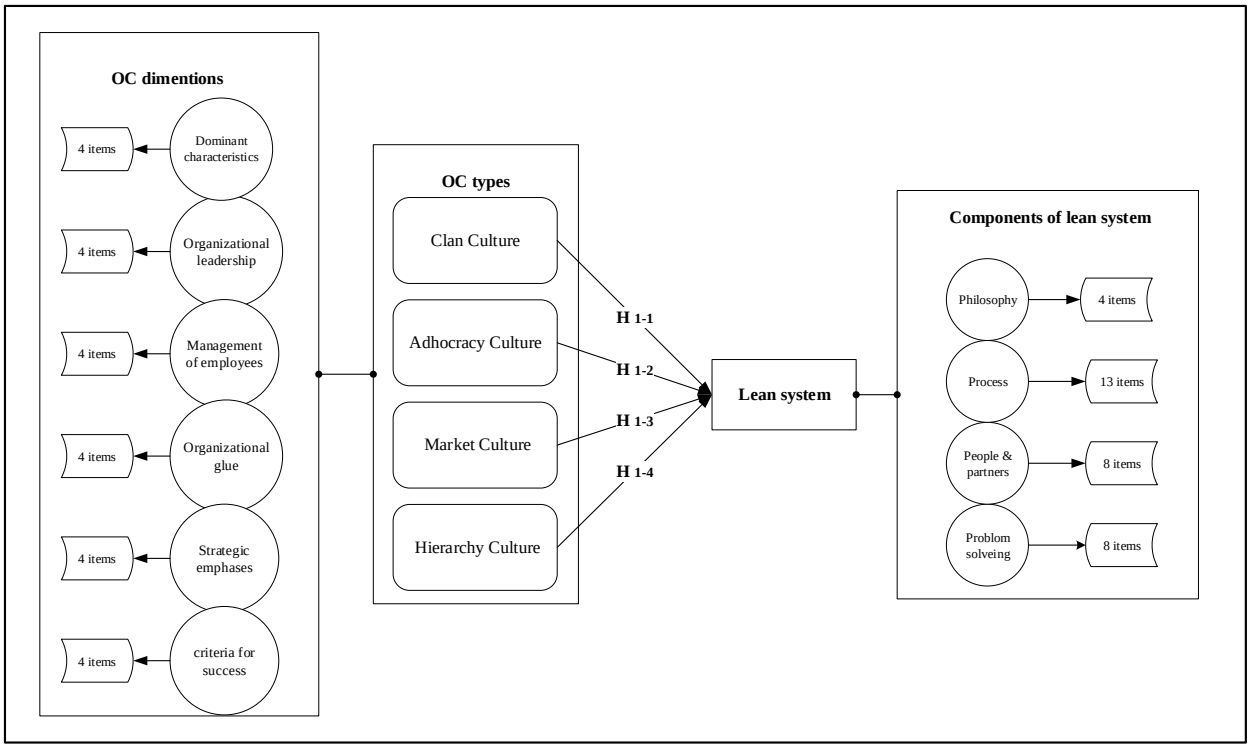

Figure 12. **Measurement research model.**
Source: author.

The research model has been designed by concerning the different types of OC derived from the six content dimensions based on the Cameron and Quinn (2011) model. And also it has been based on the Liker definition of Lean system in which contain four essential components (Liker, 2004). These are among the most frequent used models in the OC and Lean studies, for instance, the studies conducted by Hardcopf and Shah (2014); Kim and Chang (2019); Knapp (2015); Lacksonen et al. (2010); Losonci et al. (2017); Pakdil and Leonard (2015, 2017); Paro and Gerolamo (2015); Sartal et al. (2020); Tortorella et al. (2020).

As it can be reflected by the model (see fig. 12), it is aiming to identify what kinds of relationships can be existed between different types of OC and a successful implemented Lean system. The study's independent variables are OC types, accordingly, there are four independent variables in this research which are called Clan, Adhocracy, Market, and Hierarchy. In this study, it has been studied the impact of the mentioned four variables on the study's dependent variable which is called the Lean system. It is important to note that successful implemented Lean system means that the degree of organization's leanness and the ability of organizations to sustain these principles, and this variable does not refer to the performance of organizations in terms of quality, delivery, cost, profit, or anything else. Moreover, according to the Liker model in which has been mentioned the principles of this model are applicable for all kinds of firms, it can be suitable for

this research as it includes all kinds of firms such as production industry-based, service industry-based, and so on.

According to the research literature, it has been mentioned about the OC of Toyota as the main reason of successful and sustainable performance of this lean organization (Liker, 2004; Mann, 2009, 2014; Osono et al., 2008; Spear & Bowen, 1999; Wilson, 2010). That is why some noticeable research has been performed to find out the culture of successful lean organization and extract a model as a lean OC profile (Bortolotti et al., 2015; Taherimashhadi & Ribas, 2018). Through those, it has been mentioned that most of OC-Lean studies has not defined any specific OC profile to guarantee the successful lean system implementation (Bortolotti et al., 2015; Taherimashhadi & Ribas, 2018). In some studies, it has been tried to do research through some OC models such as Hofstede OC and NC models, the GLOBE model, and Cameron and Quinn model (Bortolotti et al., 2015; Erthal & Marques, 2018; Lacksonen et al., 2010; Pakdil & Leonard, 2015, 2017; Taherimashhadi & Ribas, 2018). It needs to be mentioned that some studies has been applied Liker's model for considering the Lean dimensions and their relationship with OC dimensions (Lacksonen et al., 2010; Pakdil & Leonard, 2015, 2017; Paro & Gerolamo, 2015; Sartal et al., 2020). Although in some of them it has been mentioned about some specific OC dimensions which are connected positively with the Lean system, it cannot be found any strong consensus for OC-Lean issue. It can be, therefore, firstly defined the main research hypothesis as "H1: The OC has a significant impact on Lean system implementation.", and then by considering Cameron and Quinn model, defined the other hypotheses as follows:

The clan culture mainly focuses on flexibility and internal maintenance and integration including quality strategies such as empowerment, team building, employee involvement, and open communication (Cameron & Quinn, 2011). Within the studies, it has been mentioned some critical success factors for lean transformation such as team development, communication, training, worker empowerment, and rewarding system (Nordin et al., 2012; Saad et al., 2006; Sartal et al., 2020). It was proposed that a clan cultural firm has more effective lean processes, in terms of employee involvement and teamwork (Pakdil & Leonard, 2015). By considering the collectivism characteristic related to the clan culture category, it was posited a positive relationship between collectivism and high level of lean process related to employee involvement, creativity, problem-solving processes, and decentralization at the team levels, control, standardization, and predictable performance outcomes and long-term philosophy (Pakdil & Leonard, 2017). And also, collectivism characteristic was observed in the firms with a high level of lean maturity (Bortolotti et al., 2015; Lacksonen et al., 2010). In addition, it was concluded if managers follow the clan culture approach, the lean initiatives are more likely to succeed (Knapp, 2015). Moreover, an

employee-oriented approach was observed as one of the main cultural features of firms with a high level of lean maturity (Bortolotti et al., 2015; Erthal & Marques, 2018). It is also worth addressing that, in the lean culture model proposed by Taherimashhadi and Ribas (2018), it has been mentioned about the "Sense of Belonging to the Organization" as one of the dimensions in lean firms which can consider related to some features of clan culture (Taherimashhadi & Ribas, 2018).

According to the mentioned history of the previous studies above, it has been developed the first hypothesis saying that:

$H_{1\text{-}1:}$ Features of the clan culture type positively impact on the lean system implementation.

The adhocracy culture mainly focuses on flexibility and external positioning and differentiation including quality strategies such as creating new standards, anticipating needs, continuous improvement, and finding creative solutions (Cameron & Quinn, 2011). Within the studies, it was found the positive impact of the adhocracy culture on the lean system and considered as the most supportive OC type for the lean system (Hardcopf & Shah, 2014). It was also posited that an adhocracy cultural firm has more effective lean processes, in terms of creativity, problem-solving processes, and decentralization(Pakdil & Leonard, 2015). In addition, it was concluded that if managers follow the adhocracy cultures approach, lean initiatives are more likely to succeed (Knapp, 2015). By considering the low uncertainty avoidance characteristic related to the adhocracy culture category, it was posited a positive relationship between low uncertainty avoidance and high level of lean process related to creativity, problem-solving processes, and decentralization at the individual and team levels (Pakdil & Leonard, 2017). And also by considering the low level of assertiveness and future orientation characteristics related to the adhocracy culture category, these characteristics were observed in the firms with a high level of lean maturity (Bortolotti et al., 2015). Moreover, it was observed the adhocracy culture has a positive impact on some practices of the lean system (Losonci et al., 2017). It is also worth addressing that, in the lean culture model proposed by Taherimashhadi and Ribas (2018), it has been mentioned about the "Courage to Accept Changes" as one of the dimensions in lean firms which can consider related to some features of adhocracy culture (Taherimashhadi & Ribas, 2018). At the last, it was found the open system approaches seem to align with lean system (Erthal & Marques, 2018).

According to the mentioned history of the previous studies above, it has been developed the second hypothesis saying that:

$H_{1\text{-}2:}$ Features of the adhocracy culture type positively impact on the lean system implementation.

The hierarchy culture mainly focuses on control and stability and internal maintenance and integration including quality strategies such as error detection, measurement, process control, and quality statistical tools (Cameron & Quinn, 2011). By comparing the characteristics of each OC types with the main aspects of each Toyota principle, it was found the hierarchy Culture profile can be more compatible with lean principles compared to other OC types (Paro & Gerolamo, 2015). Also, it was posited that a hierarchical cultural firm has more effective lean processes, in terms of control, standardization, and predictable performance outcome techniques (Pakdil & Leonard, 2015). In addition, by considering the masculinity, high power distances, high uncertainty avoidance characteristics related to the hierarchy culture category, it was posited that a positive relation between these characteristics and high level of lean process related to control, standardization, and predictable performance outcomes (Pakdil & Leonard, 2017). At the last, it was found that the tight control approach seems to align with the lean system (Erthal & Marques, 2018).

According to the mentioned history of the previous studies above, it has been developed the third hypothesis saying that:

$H_{1\text{-}3:}$ Features of the market culture type positively impact on the lean system implementation.

The market culture mainly focuses on control and stability and external positioning and differentiation including quality strategies such as measuring customer preferences, improving productivity, enhancing competitiveness, and involving customers and suppliers (Cameron & Quinn, 2011). By considering the masculinity characteristic related to the market culture category, it was concluded that the lean process works well in masculine cultural firms (Lacksonen et al., 2010). It was proposed that a market cultural firm has more effective lean processes, in terms of efficiency, productivity, and continuous quality improvement (Pakdil & Leonard, 2015). Moreover, in the lean culture model proposed by Taherimashhadi and Ribas (2018), it has been mentioned about the “Performance Orientation” as one of the dimensions in lean firms that can consider related to some features of market culture (Taherimashhadi & Ribas, 2018). It is noticeable to mention that, it was observed the market culture as the most dominant OC type in one OC-Lean research among case studies (Tortorella et al., 2020).

According to the mentioned history of the previous studies above, it has been developed the forth hypothesis saying that:

$H_{1\text{-}4:}$ Features of the hierarchy culture type positively impact on the lean system implementation.

2.2 Research Goal & Sample

The goal of this empirical research is to gather the required data in order to analyze the situation of the current OC profile and Lean system maturity of organizations in Lithuanian and Iran which are the inputs required in order to do the exploratory factor analysis and regression analysis planned for this research. This analysis can help to understand any impact of OC on successful Lean system implementation and how well can impact the dependent variable. Moreover, it is aimed to know how different the effects of OC types act on the implementation of the Lean system due to different NC in Lithuania and Iran. Accordingly, it may assist to provide any recommendations to align OC for implementing and sustaining the Lean system in Lithuanian and Iranian organizations.

In order to obtain relevant organization for the survey, a set of key terms and their combinations have been used including lean production, lean management, lean manufacturing, lean service, lean transformation, and lean implementation in English, Lithuanian and Persian. In particular, it also has been used some websites such as leanasociacija.lt, leanlietuva.lt, and leaniran.org and all the social apps related to these websites to find the relevant case studies in Lithuania and Iran.

2.3 Research Methodology

2.3.1 Research Approach, Instrument & Questionnaire Structure

The approach chosen to research is quantitative through the survey, and in terms of objectives, it can be categorized as correlational research that attempts to discover the existence of a relationship between two or more aspects of a situation. Additionally, from the viewpoint of application, it can be defined in applied research classification in which may result to improve understanding of particular business or management problems.

In the first step to do literature analysis, it was attempted to find relevant sources by using keywords such as “lean”, “lean system”, “lean management”, “lean CSFs”, “lean culture”, “lean and organizational culture”, “lean and cultural issue”, “lean and human related issue” and so on. After reviewing the research literature concerning OC-Lean issue, it has been found that most of those research has been gone through using some national database, analysis of research literature and proposing a framework and hypothesis. It was found only two empirical research related to

the OC – Lean relationship in which used quantitative approach and survey conducted by Knapp (2015); Losonci et al. (2017). It, therefore, has been one of the strong reasons to choose a quantitative approach by a survey for this research.

It was used a questionnaire as a specific research instrument with close-ended Likert scale questions. In line with the research model, the questionnaire is consist of three sections. The first section contains 24 questions related to the OC features divided into six parts representing six OC dimensions: dominant characteristics; organizational leadership; managing employees; organizational glue; strategic emphasis; and criteria of Success based on OCAI in Cameron and Quinn (2011) model. Each part includes four questions formulated in a five-point Likert scale. The scores ranged from 1 (Strongly disagree) to 5 (Strongly agree). It is important to mention that the scoring items in OCAI are considered from 100 points, but it was applied a five-point Likert scale for the questionnaire in this research by following the current similar research such as the surveys conducted by Khedhaouria et al. (2020); Kim and Chang (2019); Knapp (2015); Losonci et al. (2017). The questionnaire's second section is aiming to assess the lean maturity of case studies with 33 questions in 4 parts including philosophy, process, people and partners, and problem-solving based on the Liker (2004) model. The philosophy part contains 4 questions; the process part contains 13 questions; the people and partners part contains 8 questions, and the problem-solving part contains 8 questions. All the questions are in a five-point Likert scale with range from 1 (Strongly disagree) to 5 (Strongly agree). It is covered some general questions related to the respondents and organizational characteristics such as respondent's job title, respondent's work experience, size of the organization, the business sector, and the lean program's age in the third section of the questionnaire.

It is important to note that the questionnaire has been provided in English, Lithuanian and Persian languages and uploaded on the Google form for Lithuanian case studies and on the Porsline online survey tool for Iranian case studies. In addition, for keeping the confidentiality of the respondents, the anonymous questionnaire has been provided for the respondents

2.3.2 Sampling & Research Implementation

Firstly, it has been required to obtain the list of relevant companies that are facing the lean transformation or already have got mature in the Lean system. To do so, it has been attempted to establish contact with the influenced lean associations in both counties to gather information about preferred case studies. It also has been used key terms on internet search engines for this purpose.

In results, it has been found 65 Lithuanian companies and 10 Iranian companies with relevant features. It is not possible to publish the names of these companies in this research paper.

In the second stage, it has been attempted to make connection with different levels of managers and experts who have been dealing with lean projects and quality initiatives at the chosen companies list through the LinkedIn network. Thus, after receiving each connection on the LinkedIn network, the online questionnaire was provided in English and Lithuanian for Lithuanian respondents and in Persian for Iranian respondents. Accordingly, this method of sampling and collecting data can be considered as the judgmental non-probability sampling in which respondents have been chosen due to their proficiency and workplace. Moreover, this method was implemented to mitigate the potential risk of having a low response rate on the research.

Finally, in order to start the preliminary analysis of the results, the answers on the online survey tools was extracted and provided into the Excel format.

2.3.3 Sample Size & Research Limitations

In order to determine the sample size for multiple regression test and exploratory factor analysis, it was referred to some general rule of thumb. It has been suggested that the regression sample size can follow $N > 50 + 8m$ formulae (m is the number of the independent variables) (Green, 1991; Tabachnick & Fidell, 2013, p. 123). Also, it was suggested at least 50 participants for a correlation or regression test (VanVoorhis & Morgan, 2007). For factor analysis, it has been recommended that the sample size should not be less than 50, and preferably it would be better to have 100 or more participants (Hair et al., 2014, p. 100). Accordingly, to meet the sample size requirement, due to the sampling method once the collected filled questionnaire was reached to upper than 100 participants in each country, the attempt of sending the invitation for filling the questionnaire has been stopped. It is important to point out, it could not find any specific database or reference for the number of Lithuanian and Iranian companies with the lean system, and it was not possible to gather the entire list of those such companies, the size of the statistical population has been considered unknown. It, therefore, can be stated that the method of sampling and sample size are the limitations in this research.

3. ANALYSIS OF THE EMPIRICAL DATA

3.1 Managing data

Firstly, in order to prepare data to do analysis, it has been checked for any errors, missing data, and outliers. To do so, the frequencies of each variables has been tested by the SPSS software. It was not observed any missing data and univariate outlier data for all variables on the outcomes for samples gathered from Lithuanian and Iranian case studies.

It has been measured the Mahalanobis Distance by the Chi-square distribution with $\alpha = 0.001$ for evaluating any multidimensional outlier data (Hair et al., 2014, p. 64). For samples gathered from Lithuanian case studies, the maximum outcome was obtained 81.36, and for Iranian case studies was 80.97 which is less than $\chi 2_{(56)} = 94.47$. Therefore, it has been concluded that there is not any multidimensional outlier data.

It is important to note that, due to the online survey tools used, it has been gathered all the questionnaire without any incomplete questions or incomplete data. It has been obtained 102 samples form Lithuanian companies, and 101 from Iranian companies.

Secondly, for defining the latent variables based on the research model, it has been merged and calculated the mean of data on the relevant questions and accordingly it has been defined the Clan, adhocracy, Market, Hierarchy variables from the OC related questions and philosophy, Process, People and Partners, and Problem-solving variables from the Lean related questions.

Finally, due to having ordinal variables on the survey, it has been checked the P-P diagram as a descriptive analysis to test the normality of the variables. The outcome of this test has been illustrated in figure 13 and 14 for OC and lean variables as an example. In this research, it has been considered the variables have a normal distribution.

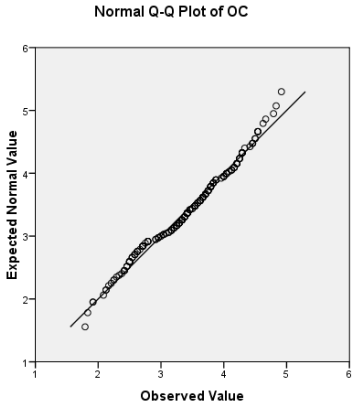

Figure 13. **Q-Q plot for OC variable.**

Source: Author.

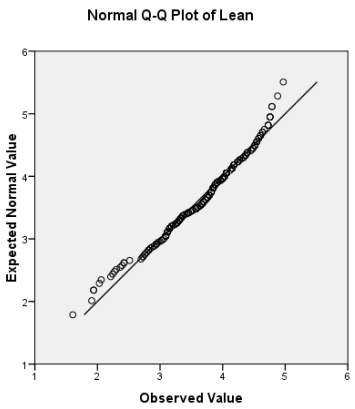

Figure 14. **Q-Q plot for Lean variable.**

Source: Author.

3.2 Descriptive statistics of the research's sample

Regarding the demographic questions on the survey, the table 2 presents that the 9.8 % and 5.0% of respondents were senior management, 21.6% and 33.7% middle management, 9.8 % and 23.8% line management, 10.8% and 31.7% group supervisor, and the remaining 48% and 5.9% had a different job title in Lithuanian and Iranian companies, respectively. It is important to note that almost half of the Lithuanian respondents (49.0%) did not consider themselves in defined categories which can because of having job titles such as business analyst, lean project coordinator, process specialist, quality engineer, quality assurance expert, supply chain specialist, system expert and so on.

Table 2

Distribution of respondents on the subject of their job title

Job title in the company	Lithuania	Iran
Senior management	9.8%	5.0%
Middle management	21.6%	33.7%
Line management	9.8%	23.8%
Group supervisor	10.8%	31.7%
Or others	49.0%	5.9%

(Source: author)

Table 3 presents that most of the Lithuanian respondents had work experience in the range of 1 to 3 years with 44.1% of the total, and the second place, it stood with 21.6 % for the respondents with more than 5 years of work experience. The remainder is for less than a year work experienced respondents and 3 to 5 years work experienced respondents with 17.6 % and 16.7 %, respectively. However, most of the Iranian respondents had more than five years of work experience with 55.4% of the total, and it came through between 1 to 3 years of work experience with 27.7%. The remainder is for 3 to 5 years work experienced respondents and less than a year work experienced respondents with 11.9% and 5.0%, respectively.

Table 3

Distribution of respondents on the subject of their work experience

Work experience in the company	Lithuania	Iran
Less than a year	17.6%	5.0%
Between 1 to 3 years	44.1%	27.7%
Between 3 to 5 years	16.7%	11.9%
More than 5 years	21.6%	55.4%

(Source: author)

It was observed the most of the firms on the survey classified in the large size business by the respondents with 52.9 % and 78.2% in Lithuania and Iran, respectively. Whereas 39.2 % of Lithuanian companies and 18.8% of Iranian companies considered with medium business size, and a few of them with considered in small business size by the respondents (see table 4).

Table 4

Distribution of respondents on the subject of their organization size

Size of the organization	Lithuania	Iran
Small business: less than 100 employees	7.8%	3.0%
Medium business: Between 100 to 500 employees	39.2%	18.8%
Large business: more than 500 employees	52.9%	78.2%

(Source: author)

In terms of the business sector, the 65.7% of the firms were manufacturing-based companies and 34.3 % of the remainder were service provider companies among the Lithuanian case studies; However, most of the Iranian case studies were manufacturing-based companies (see table 5). It is important to note that in addition to the manufacturing and service options in the questionnaire, there were other options to choose such as “mineral” and “agriculture and fisheries”; however, those were not chosen by respondent in both countries.

Table 5

Distribution of respondents on the subject of the business sector of their organization

The business sector classification	Lithuania	Iran
Manufacturing	65.7%	97.0%
Service	34.3%	3.0%

(Source: author)

As it is presented in the table 6, the majority of the firms have been applying the lean system for more than 3 years with 63.7 % and 88.1% in Lithuania and Iran, respectively. The Lithuanian companies with the range 1 to 3 years lean implementation experience and less than a year experience were the next places with 21.6 % and 14.7 %, respectively; However, in Iranian case studies, it was not observed any companies with less than a year lean implementation, and 11.9% of them classified in the between 1 to 3 years category.

Table 6

Distribution of respondents on the subject of duration of lean implementation in their organization

Duration of lean implementation in the organization	Lithuania	Iran
Less than a year	14.7%	0.0%
Between 1 to 3 years	21.6%	11.9%
More than 3 years	63.7%	88.1%

(Source: author)

To restate the remarkable findings based on the obtained data by the demographic questions on the survey, it can be mentioned that most of the companies were categorized in large size, manufacturing business sector and with more than 3 years' experience in lean implementation in both countries.

3.3 Data validity

Taking into consideration that OCAI (organizational culture assessment tool) based on Cameron and Quinn (2011) has been used since publishing by many OC researchers for their studies, for instance, Hardcopf and Shah (2014); Khedhaouria et al. (2020); Kim and Chang (2019); Knapp (2015); Losonci et al. (2017); Pakdil and Leonard (2015); Paro and Gerolamo (2015); Tortorella et al. (2020); it can be considered that this instrument has enough validity for assessing the OC features.

In order to check the validity of Lean assessment instrument based on 4P Liker (2004) model, the Exploratory Factor Analysis (EFA) has been used in this analysis. To do so, the 33 items of the Lean items were subjected to principal components analysis (PCA) using SPSS. Prior to performing PCA, the suitability of data for factor analysis was assessed. Inspection of the correlation matrix revealed the presence of many coefficients of 0.3 and above. The Kaiser-Meyer-Olkin value was 0.94, exceeding the recommended value of 0.6 and Bartlett's test of Sphericity reached statistical significance ($p < 0.05$), supporting the factorability of the correlation matrix (Tabachnick & Fidell, 2013). The anti-image correlation matrix showed the measure of sampling adequacy (MSA) values 0.80 and above which exceed the 0.5 as a minimum acceptable level (Hair et al., 2014, p. 103).

Principal components analysis revealed the presence of six components with eigenvalues exceeding 1, explaining 42.09%, 7.05%, 4.17%, 3.10%, and 3.05% of the variance respectively. An inspection of the scree plot revealed a considerable break after the third components and began to straighten out (see fig. 15). Therefore, it was decided to analysis with the first three components.

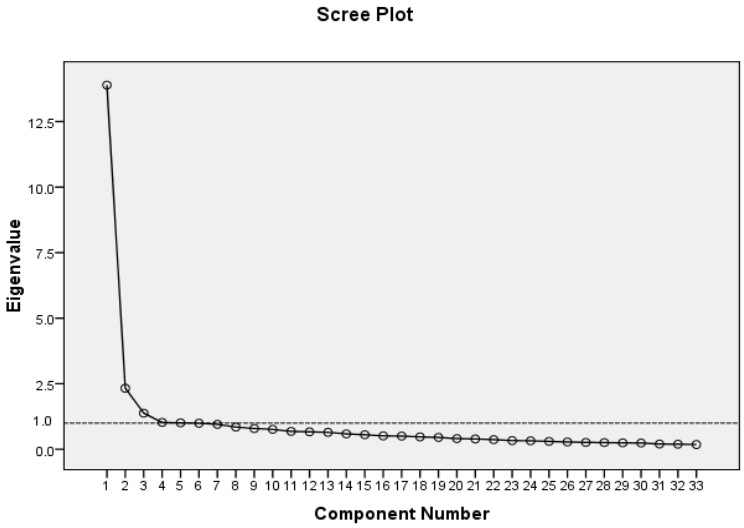

Figure 15. **The scree plot of EFA solution of lean items.**

Source: author.

The data was rotated by the Oblimin method with Delta 0.7 (see table 7). The component correlation matrix showed some relationships between factors more than 0.3. Accordingly, it has been decided to continue to analyze by the Oblimin rotation method.

Table 7

Pattern Matrix for PCA with Oblimin rotation and delta 0.7 of three factor solution of Lean items

Item	Pattern coefficients		
	Component 1	Component 2	Component 3
P1L25	.569		
P1L26	.807		
P1L27	.720	-.552	.503
P1L28	-.461		1.072
P2L29			1.003
P2L30			.765
P2L31			.551
P2L32			.516
P2L33			.672
P2L34			.617
P2L35			.762
P2L36			.576
P2L37			.419
P2L38		.980	
P2L39		.519	
P2L40	.440	.455	
P2L41	.602		
P3L42	.628		
P3L43	.609		
P3L44	.672		

(Source: author)

Continuation of Table 7

Pattern Matrix for PCA with Oblimin rotation and delta 0.7 of three factor solution of Lean items

Item	Pattern coefficients		
	Component 1	Component 2	Component 3
P3L45	.800		
P3L46	.729		
P3L47	.532	.468	
P3L48	1.154		-.577
P3L49	1.043		
P4L50	1.042		
P4L51	.904		
P4L52		1.026	
P4L53		.702	
P4L54		.712	
P4L55		.797	
P4L56	-.564	1.260	
P4L57		1.084	

(Source: author)

Due to having a sample of 203 respondents, the significant factor loading should be ≥ 0.40 based on a 0.05 significance level (α) and power level of 80 percent (Hair et al., 2014, p. 115). As it was presented in the table 7, items loading above 0.40 on each component, so it may be stated that this solution is optimal. The main loadings on component 1 are items 25, 26, 27, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, and 51. By referring back to the actual items on the research model, it can be identified that component 1 presents the combination of the Philosophy scale and People and Partners scale. The main loadings on component 2 are items 38, 39, 40, 52, 53, 54, 55, 56, and 57. It can be identified that component 2 relates to the problem-solving scale on the original model. The main loadings on component 3 are items 28, 29, 30, 31, 32, 33, 34, 35, 36, and 37. It can be identified that component 3 presents the aspects of the process scale on the original model. Therefore, it can be labeled component 1 with "Philosophy, People and Partners" by merging the items contained on “Philosophy” and “People and Partners” on the original model, and labeled component 2 with "Problem-solving" by keeping the same items on the original model, and similarly, labeled the component 3 with "Process" by keeping the same items on the original model. However, it was decided to keep the original model with four separate components.

3.4 Data reliability

In order to check the reliability of gathered data through OCAI, it has been used Cronbach’s alpha the most widely used measure by considering 0.70 as a lower limit for this measure (Hair et al., 2014, p. 123). To do so, it has been checked the internal consistency of OC items related to each scale by SPSS software. As it is presented in the table 8, the gathered data by OCAI has an

adequate internal consistency. Therefore, it can be confirmed the reliability of data related to OC items.

Table 8

Cronbach's alpha test result for OC items data

Scale	Mean	Cronbach's Alpha	N of cases
Clan	3.42	0.85	203
Adhocracy	3.17	0.83	203
Market	3.41	0.78	203
Hierarchy	3.71	0.80	203

(Source: author)

Similarly, it has been checked the internal consistency of Lean items data related to each scale based on 4P Liker model. As it is presented in the tables 9, it can be stated that data gathered by this model has an adequate internal consistency. Therefore, it can be confirmed the reliability of data related to Lean items. It needs to mention that the reliability value will be increased by increasing the number of items for each scale (Hair et al., 2014, p. 123). Based on the model, "Philosophy" scale was defined by 4 items, "Process" scale was defined by 13 items, and 8 items were covered for "People and Partners" and "Problem-solving" scales. Therefore, it can be explained the reason of obtaining 0.91 for "Process" scale.

Table 9

Cronbach's alpha test result for Lean items data

Scale	Mean	Cronbach's Alpha	N of cases
Philosophy	3.70	0.71	203
Process	3.69	0.91	203
People and Partners	3.62	0.86	203
Problem-solving	3.58	0.86	203

(Source: author)

Accordingly, after validity and reliability analysis of data, the descriptive statistics of OC-related items where participants were asked to grade on a Likert scale from 1 to 5 (1 – strongly disagree; 5 – strongly agree) by considering the actual status of their companies has been summarized in table 10. By comparing the achieved mean of score among the OC types on this survey, it can be stated that the predominant OC profile by respondents' point of view was Hierarchy with an average score of 3.94 and 3.47 out of 5 in Lithuania and Iran, respectively. Whereas the second place was stood for Market OC type with an average score of 3.74 in Lithuania, and with an average score of 3.16 for Clan OC type in Iran. It might be stated the Lithuanian participants in this survey believe that their firm emphasizes more on stability, order, and control, whereas Iranian respondents believe that their firm emphasizes more on internal focus and integration.

Table 10

Descriptive statistics of OC items in Lithuania and Iran

OC types	Items	Lithuania		Iran	
		Mean	Std. Deviation	Mean	Std. Deviation
Clan	1- The organization is a very personal place. It is like an extended family. People seem to share a lot of themselves.	3.67	0.96	2.81	1.08
	5- The leadership in the organization is generally considered to exemplify mentoring, facilitating, or nurturing.	3.71	1.12	3.08	1.02
	9- The management style in the organization is characterized by teamwork, consensus, and participation.	3.61	1.14	3.59	0.96
	13- The glue that holds the organization together is loyalty and mutual trust. Commitment to this organization runs high.	3.74	1.04	3.09	1.09
	17- The organization emphasizes human development. High trust, openness, and participation persist.	3.79	1.15	3.12	1.06
	21- The organization defines success on the basis of the development of human resources, teamwork, employee commitment, and concern for people.	3.55	1.19	3.28	1.13
		Mean = 3.67		Mean = 3.16	
Adhocracy	2- The organization is a very dynamic and entrepreneurial place. People are willing to stick their necks out and take risks.	3.54	0.98	2.72	0.89
	6- The leadership in the organization is generally considered to exemplify entrepreneurship, innovation, or risk-taking.	3.53	0.98	2.91	0.89
	10- The management style in the organization is characterized by individual risk-taking, innovation, freedom, and uniqueness.	3.25	1.06	2.26	0.83
	14- The glue that holds the organization together is a commitment to innovation and development. There is an emphasis on being on the cutting edge.	3.94	1.12	2.83	1.15
	18- The organization emphasizes acquiring new resources and creating new challenges. Trying new things and prospecting for opportunities are valued.	3.91	0.94	2.86	1.18
	22- The organization defines success on the basis of having the most unique or newest products. It is a product leader and innovator.	3.35	1.17	2.87	1.03
		Mean = 3.58		Mean = 2.74	
Market	3- The organization is very results-oriented. A major concern is with getting the job done. People are very competitive and achievement-oriented.	4.05	.979	3.30	0.95
	7- The leadership in the organization is generally considered to exemplify a no-nonsense, aggressive, results-oriented focus.	3.93	1.007	3.20	0.89
	11- The management style in the organization is characterized by hard-driving competitiveness, high demands, and achievement.	3.46	1.031	2.35	0.82
	15- The glue that holds the organization together is the emphasis on achievement and goal accomplishment.	3.49	.952	3.38	1.12
	19- The organization emphasizes competitive actions and achievement. Hitting stretch targets and winning in the marketplace are dominant.	3.88	.998	3.11	1.10
	23- The organization defines success on the basis of winning in the marketplace and outpacing the competition. Competitive market leadership is key.	4.05	1.185	3.18	1.14
		Mean = 3.74		Mean =3.08	
Hierarchy	4- The organization is a very controlled and structured place. Formal procedures generally govern what people do.	4.07	1.007	3.69	.809
	8- The leadership in the organization is generally considered to exemplify coordinating, organizing, or smooth-running efficiency.	3.86	1.081	3.45	1.034
	12- The management style in the organization is characterized by the security of employment, conformity, predictability, and stability in relationships.	3.54	1.002	3.31	1.017
	16- The glue that holds the organization together is formal rules and policies. Maintaining a smooth-running organization is important.	3.79	1.129	3.50	.890
	20- The organization emphasizes permanence and stability. Efficiency, control, and smooth operations are important.	4.09	.966	3.39	1.029
	24- The organization defines success on the basis of efficiency. Dependable delivery, smooth scheduling, and low-cost production are critical.	4.31	.923	3.47	1.035
		Mean = 3.94		Mean = 3.47	

(Source: author)

The descriptive statistics of Lean-related items where participants were asked to grade on a Likert scale from 1 to 5 (1 – strongly disagree; 5 – strongly agree) by considering the actual status of their companies has been summarized in table 11. Due to the achieved mean of score presented in this table, it can be stated that lean Lithuanian firms have matured well on relationships with their business partnerships (item 3), establishing the continues flow in their process (item 5), process standardization (item 11 & 12) and Genchi Genbutsu as a solving problem method (item 26). And on the contrary, they have not been in a good level on visual controls and indicators (item 13), using the A3 report properly (item 28), and using the Hoshin kanri approach (item 32) yet. In general, regarding respondents' perspective, Lithuanian lean firms have been more mature in lean principles related to the philosophy section (mean = 3.91), and also lean principles related to the process section (mean = 3.82) compared to other lean principles.

Table 11

Descriptive statistics of Lean-related items in Lithuania and Iran

P	Items	Lithuania		Iran	
		Mean	Std. Deviation	Mean	Std. Deviation
Philosophy	1- In the organization, there is a great sense of common purpose in which people can distinguish right from wrong with regard to that mission.	3.56	1.17	3.55	0.95
	2- The starting point in the organization is generating value for the customer, society, and the economy so that evaluation of every function in the company is done in terms of its ability to achieve this.	3.95	1.04	3.56	0.88
	3- The organization has a sense of responsibility for its business partners for stable, long-term growth, and mutual benefits.	4.25	.84	3.62	0.96
	4- The organization is acting with self-reliance and trust in its own abilities rather than relying on outside business partners.	3.92	1.00	3.23	1.02
		Mean = 3.91		Mean = 3.49	
Process	5- The organization strives to redesign work processes to achieve continuous flow wherever is applicable in its processes.	4.22	0.98	3.72	0.94
	6- The organization coordinates activities, equipment and people in a continuous flow process.	3.98	0.97	3.55	0.94
	7- Where it is not possible to create a continuous flow, the organization strives to design a pull system to supply downline customers in the process.	3.65	0.95	3.38	0.99
	8- The organization strives to level out the workload for reducing the unevenness in its process and minimizing the chance of overburden.	3.64	1.11	3.48	0.95
	9- The organization strives to provide a work environment for automatic detection of problems or defects at an early stage and continue to proceed only after resolving the problem at its root cause.	3.84	1.07	3.34	1.03
	10- The organization strives to standardize all activities with a focus on three elements Takt time, the sequence of processes, and the amount of required resources.	3.99	1.13	3.59	0.95
	11- Standardization is considered the basis for continuous improvement and quality management.	4.27	0.91	3.81	.97
	12- All the staff are encouraged to improve the standards in the organization.	4.13	1.11	3.81	.83
	13- Visual controls and indicators are using creatively as communication tools in the work environment.	2.84	1.45	3.83	.96
	14- Using an A3 report format to describe all the information about the state of any problem is a must for all staff.	3.63	1.26	3.19	1.02

(Source: author)

Continuation of Table 11

The descriptive statistics of Lean-related items in Lithuania and Iran

P	Items	Lithuania		Iran	
		Mean	Std. Deviation	Mean	Std. Deviation
Process	15- Before implementing any new technology, it is assured that this kind of technology can make any additional improvements, and will not conflict lean principles.	3.61	1.31	3.64	.95
	16- Before adding technology to automate the process, it is tried to kaizen the process and work out the manual process, and eliminate waste as much as possible.	3.73	1.09	3.56	1.01
	17- The organization strives to implement any new technology smoothly without employee resistance and process disruption.	3.72	1.16	3.29	1.04
		Mean = 3.82		Mean = 3.55	
People and Partners	18- The organization prefers to develop its staff and grow leaders instead of hiring someone as leaders from outside of the company.	3.72	1.16	3.35	1.16
	19- The leader's real challenge is having the long-term vision of knowing what to do, the knowledge of how to do it, and the ability to develop people for doing their job excellently.	3.97	1.00	3.57	0.99
	20- It has been defined organization structure and leadership positions properly to manage innovation and development projects for meeting customer requirements well.	3.83	0.97	3.51	0.86
	21- The organization strives to create a strong, stable culture in which teamwork is widely supported, and considered it as the foundation of the company.	4.00	1.11	3.44	1.03
	22- It is established an excellent balance between individual work and group work and between individual excellence and team effectiveness in the organization.	3.63	1.04	3.45	0.95
	23- The organization strives to empower employees and use a bottom-up management style in which shop floor workgroups are the focal point for problem-solving.	3.73	1.18	3.47	0.90
	24- The organization strives to find reliable partners and suppliers, treat them as an extension of its business, and grow the business together to get mutually benefit in the long term.	3.75	1.04	3.50	0.94
	25- The organization challenges partners and suppliers by setting ambitious targets and teaches and assists them in how to reach them and taking care of them to solve their issues.	3.66	1.09	3.33	0.91
		Mean = 3.78		Mean = 3.45	
Problem-solving	26- Solving problems and improving processes is done by collecting facts and data at the actual site of the work or problem.	4.10	0.96	3.59	0.95
	27- The decisions are made after understanding the real situation and considering the causes and discussing different options and solutions through consensus within the team.	3.91	0.98	3.59	0.85
	28- The A3 report is used broadly to communicate within the team and getting consensus efficiently on complex decisions.	3.08	1.47	3.32	1.11
	29- Continuous improvement (kaizen) is used by all leaders and associates as an attitude and way of thinking and the approach of self-reflection and even self-criticism to reach the desired improvement.	3.68	1.18	3.42	0.92
	30- The organization strives to protect the organizational knowledge base by developing stable personnel, slow promotion, and very careful succession systems.	3.42	1.21	3.51	1.04
	31- The five-why analysis is used to get the root cause of a real problem and taking countermeasures to prevent the reoccurrence of the problem.	3.77	1.33	3.61	0.88
	32- The organization strives to use the Hoshin kanri (policy deployment) approach to set goals and measure the progress toward those objectives.	2.94	1.29	3.75	1.06
	33- The organization is continually using PDCA at all levels of the company, from the project to the group, at the whole enterprise-level and ultimately the entire value chain.	3.61	1.22	3.97	0.91
		Mean = 3.56		Mean = 3.59	

(Source: author)

Taking into consideration the achieved mean of score for Iranian case studies in table 11, it can be mentioned that those firms were on the good level of lean implementation in standardization (item 11 & 12), applying the PDCA thinking (item 33), and also in visual controls (item 13). On the contrary, they have not been in a good enough level on using an A3 report method (item 14 & 28), and relationships with their business partnerships (item 4 & 25). In general, regarding respondents' perspective, Iranian lean firms have been more mature in lean principles related to the Problem-solving section (mean = 3.59), and also lean principles related to the process section (mean = 3.55) compared to other lean principles.

3.5 Impact analysis of organizational culture upon lean system

To do test the research hypotheses included in the research model, the related data has been analyzed through the correlation and regression test on SPSS in three parts; first with only Lithuanian case studies data, then with only Iranian case studies data, and finally with all data of these two countries.

As it was elaborated in the research design chapter, the research hypotheses can be illustrated in figure 16.

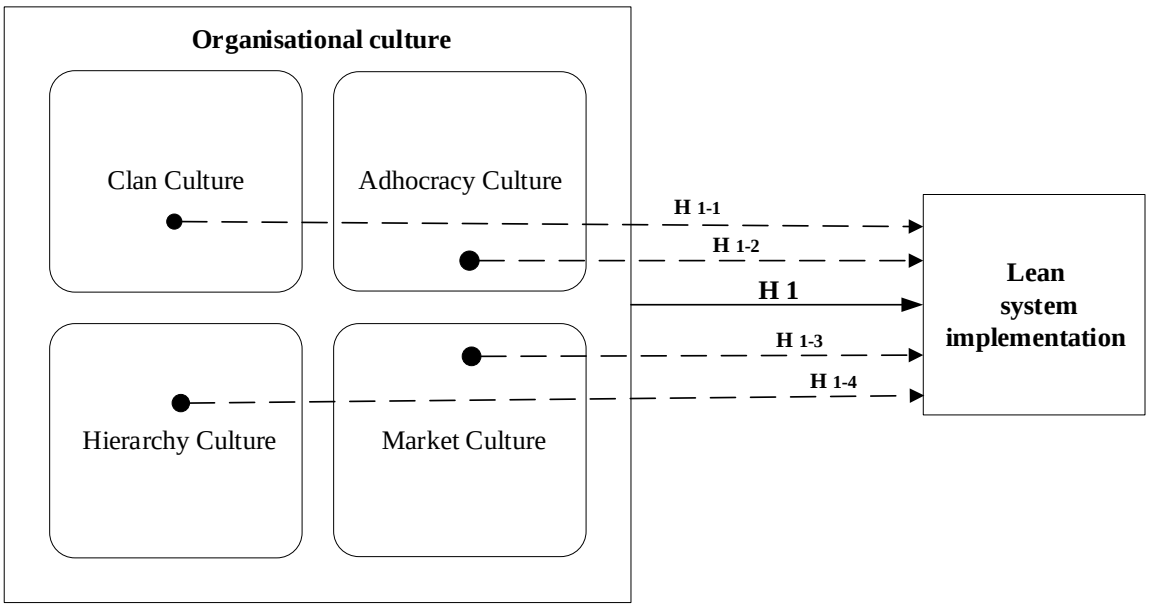

Figure 16. **Research hypotheses.**
Source: author.

The main research hypothesis has been formatted as below:

H_1: The OC has a significant impact on Lean system implementation.

The other research hypothesizes following the main research hypothesis have been formatted as below:

- $H_{1\text{-}1}$: Features of the clan culture type positively impact on the lean system implementation.
- $H_{1\text{-}2}$: Features of the adhocracy culture type positively impact on the lean system implementation.
- $H_{1\text{-}3}$: Features of the market culture type positively impact on the lean system implementation.
- $H_{1\text{-}4}$: Features of the hierarchy culture type positively impact on the lean system implementation.

3.5.1 Lithuania data analysis

Firstly, the relationship between OC and Lean was investigated using the Pearson product-moment correlation coefficient. There was a strong, positive correlation between the two variables, r=0.79, n=102, P < 0.001, with high levels of perceived OC associated with high levels of perceived Lean system. It, therefore, can be accepted the hypothesis.

The method multiple regression was used to assess the ability of independent variables (Clan, Adhocracy, Market, Hierarchy) to predict level of dependent variable (Lean system). Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, multicollinearity and homoscedasticity. As it is illustrated in figure 18, it revealed a reasonably straight diagonal line. In addition, the scatterplot of the standardized residuals showed roughly rectangular distributed points (see fig. 17).

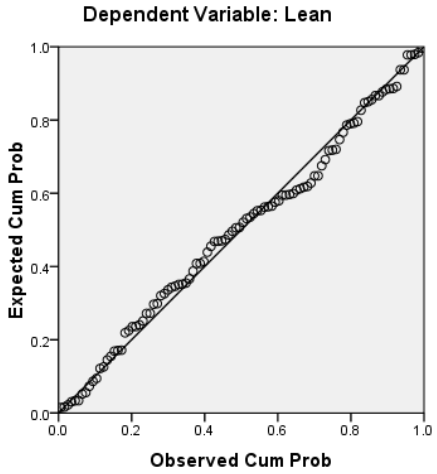

Figure 18. **Normal P-P plot of regression standardized residual (Lithuania data).** Source: author.

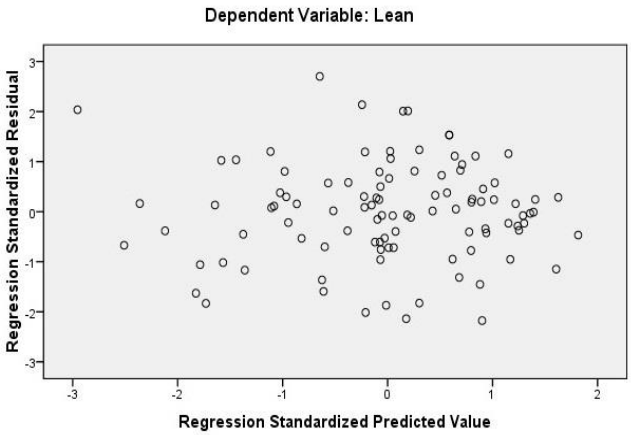

Figure 17. **Scatterplot of the standardized residual (Lithuania data).** Source: author

To check the multicollinearity, the correlations between the variables were inspected. The independent variables (clan, adhocracy, hierarchy, and market) were correlated with the dependent variable of lean (0.77, 0.64, 0.52, 0.68 respectively) with value upper than 0.30 and also the correlation between each of the independent's variables were less than 0.70. The tolerance of independent variables was obtained higher than 0.10 for each of them, and also VIF values were less than 10 (see table 13). It, therefore, cannot indicate any multicollinearity. Moreover, it was not found any unusual case (Pallant, 2013, p. 164).

Table 12 shows the results of regression analysis for lean system as the dependent variable. The first model enters all candidate variables including clan, adhocracy, hierarchy, and market. The second and better model excludes the "market" variable from model 1. Considering the model 2 as the appropriate model, the total variance explained by the model as a whole was 67.0 % (R^2 = 0.67), F (3, 98) = 66.32, p < .001. The Durbin-Watson coefficient was 1.67 so that it can be concluded there is no autocorrelation between residuals (Schreiber-Gregory, 2018).

Table 12

Model summary of regression analysis considering data of Lithuania

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0.82[a]	0.67	0.66	0.43	
2	0.82[b]	0.67	0.66	0.43	1.67

a. Predictors: (Constant), Hierarchy, Adhocracy, Market, Clan

b. Predictors: (Constant), Hierarchy, Adhocracy, Clan

c. Dependent Variable: Lean system

(Source: author)

Based on model 2 it can be stated the Clan, Adhocracy and Hierarchy variables made a significant unique contribution to the prediction of Lean system as a dependent variable; however, the Market were not statistically significant. As presented by table 13, the standardized coefficient value of Clan variable was 0.44, t > 1.96, p <0.05, for Adhocracy variable was 0.20, t > 1.96, p <0.05, and for Hierarchy variable was 0.29, t > 1.96, p < 0.05 (see table 13). Accordingly the regression equation can be considered "Lean = 0.36 + 0.38 (Clan) + 0.21 (Adhocracy) + 0.32 (Hierarchy)" for this model.

Table 13

Coefficients of the regression model 2 for data of Lithuania

Model 2	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	0.36	0.28		1.30	0.19		
Clan	0.38	0.08	0.44	4.82	0.00	0.39	2.52
Adhocracy	0.21	0.08	0.20	2.56	0.01	0.54	1.84
Hierarchy	0.32	0.08	0.29	3.76	0.00	0.56	1.78

(Source: author)

By the above result, it can be accepted the $H_{1\text{-}1}$, $H_{1\text{-}2}$, and $H_{1\text{-}4}$ of the research hypothesizes related to the features of Clan, Adhocracy, and Hierarchy culture types respectively, and also rejected the $H_{1\text{-}3}$ of the research hypothesizes related to the features of Market culture type.

3.5.2 Iran data analysis

Firstly, the relationship between OC and Lean was investigated using the Pearson product-moment correlation coefficient. There was a strong, positive correlation between the two variables, r=0.85, n=101, P < 0.001, with high levels of perceived OC associated with high levels of perceived Lean system. It, therefore, can be accepted the hypothesis.

The method multiple regression was used to assess the ability of independent variables (Clan, Adhocracy, Market, Hierarchy) to predict level of dependent variable (Lean system). Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, multicollinearity and homoscedasticity. As it is illustrated in figure 20, it revealed a reasonably straight diagonal line. In addition, the scatterplot of the standardized residuals showed roughly rectangular distributed points (see fig. 19).

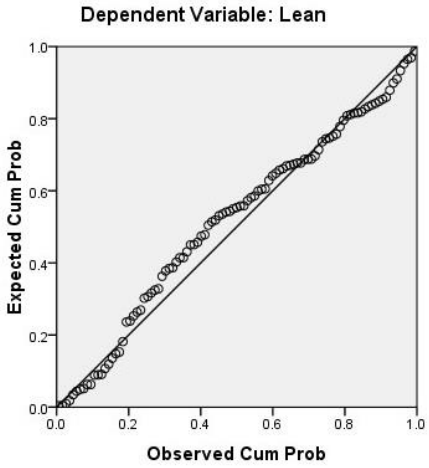

Figure 20. **Normal P-P plot of regression standardized residual (Iran data).**

Source: author.

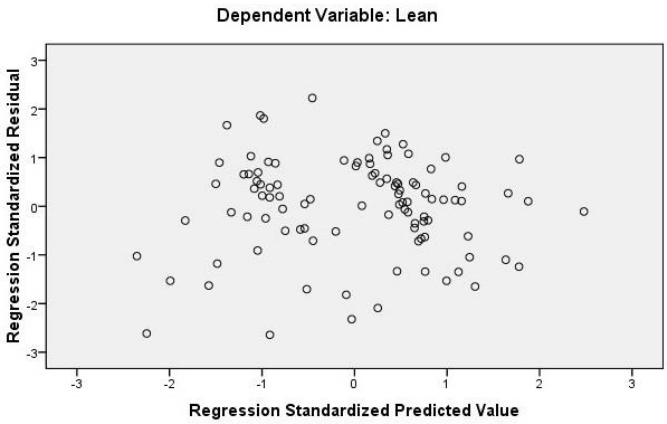

Figure 19. **Scatterplot of the standardized residual (Iran data).**

Source: author.

To check the multicollinearity, the correlations between the variables were inspected. The independent variables (clan, adhocracy, hierarchy, and market) were correlated with the dependent variable of lean (0.77, 0.74, 0.64, 0.78, respectively) with value upper than 0.30. Although it was revealed some correlation with values higher than 0.70 between the independent's variables, the tolerance of independent variables was obtained higher than 0.1 for each of them, and also VIF values were less than 10 (see table 15). It, therefore, cannot indicate any multicollinearity.(Pallant, 2013, p. 164).

Table 14 shows the results of regression analysis for lean system as the dependent variable. The first model enters all candidate variables including clan, adhocracy, hierarchy, and market. The second and better model excludes the "market" variable from model 1. Considering the model 2 as the appropriate model, the total variance explained by the model as a whole was 69.3 % ($R2 = 0.69$), $F(3, 97) = 95.45$, $p < .001$. The Durbin-Watson coefficient was 1.53 so that it can be concluded there is no autocorrelation between residuals (Schreiber-Gregory, 2018).

Table 14

Model summary of regression analysis considering data of Iran

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0.84[a]	0.69	0.68	0.31	
2	0.84[b]	0.69	0.68	0.32	1.53

a. Predictors: (Constant), Hierarchy, Adhocracy, Market, Clan

b. Predictors: (Constant), Hierarchy, Adhocracy, Clan

c. Dependent Variable: Lean system

(Source: author)

Based on model 2 it can be stated the Clan, Adhocracy and Hierarchy variables made a significant unique contribution to the prediction of Lean system as a dependent variable; however, the Market were not statistically significant. As presented by table 15, the standardized coefficient value of Clan variable was 0.33, $t > 1.96$, $p < 0.05$, for Adhocracy variable was 0.19, $t > 1.96$, $p < 0.05$, and for Hierarchy variable was 0.45, $t > 1.96$, $p < 0.05$ (see table 15). Accordingly the regression equation can be considered "Lean = 0.96 + 0.26 (Clan) + 0.16 (Adhocracy) + 0.38 (Hierarchy)" for this mode.

Table 15

Coefficients of the regression model 2 for data of Iran

Model 2	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**	**Collinearity Statistics**	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	0.96	0.16		6.10	0.00		
Clan	0.26	0.07	0.33	3.66	0.00	0.32	3.11
Adhocracy	0.16	0.07	0.19	2.13	0.04	0.32	3.09
Hierarchy	0.38	0.06	0.45	6.50	0.00	0.55	1.82

(Source: author)

By the above result, it can be accepted the $H_{1\text{-}1}$, $H_{1\text{-}2}$, and $H_{1\text{-}4}$ of the research hypothesizes related to Clan, Adhocracy, and Hierarchy culture types respectively, and also rejected the $H_{1\text{-}3}$ of the research hypothesizes related to the Market culture types.

3.5.3 Analysis of Lithuania and Iran cumulative data

As it has been analysis for Lithuanian data and Iranian data to test research hypothesizes separately, for all data, the relationship between OC and Lean was investigated using the Pearson product-moment correlation coefficient as well. There was a strong, positive correlation between the two variables, $r=0.79$, $n=203$, $P < 0.001$, with high levels of perceived OC associated with high levels of perceived Lean system. It, therefore, can be accepted the hypothesis.

The method multiple regression was used to assess the ability of independent variables (Clan, Adhocracy, Market, Hierarchy) to predict level of dependent variable (Lean system). Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, multicollinearity and homoscedasticity. As it is illustrated in figure 20, it revealed a reasonably straight diagonal line. In addition, the scatterplot of the standardized residuals showed roughly rectangular distributed points (see fig. 21).

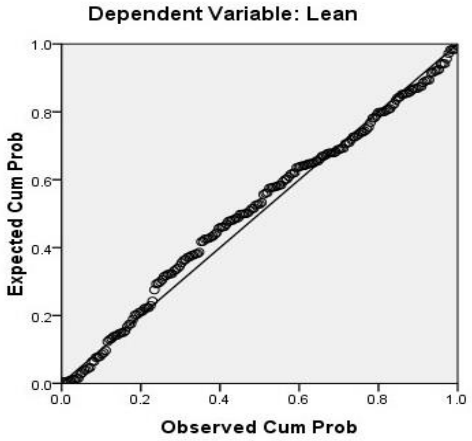

Figure 22. **Normal P-P plot of regression standardized residual (Lithuania and Iran cumulative data).**

Source: author.

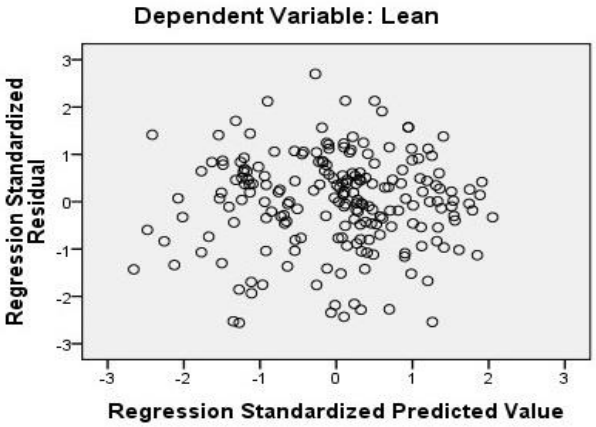

Figure 21. **Scatterplot of the standardized residual (Lithuania and Iran cumulative data).**

Source: author.

To check the multicollinearity, the correlations between the variables were inspected. The independent variables (clan, adhocracy, hierarchy, and market) were correlated with the dependent variable of lean (0.77, 0.66, 0.58, 0.73, respectively) with value upper than 0.30. Although it was revealed some correlation with values higher than 0.70 between the independent's variables, the tolerance of independent variables was obtained higher than 0.1 for each of them, and also VIF values were less than 10 (see table 17). It, therefore, cannot indicate any multicollinearity. Moreover, it was not found any unusual case (Pallant, 2013, p. 164).

Table 16 shows the results of regression analysis for lean system as the dependent variable. The first model enters all candidate variables including clan, adhocracy, hierarchy, and market. The second model excludes the "market" variable from model 1, and the third and best model excludes the "adhocracy" variable from model 2. Considering the model 3 as the appropriate model, the total variance explained by the model as a whole was 67.7 % ($R2 = 0.68$), $F (2, 200) = 206.36$, $p < .001$. The Durbin-Watson coefficient was 1.58 so that it can be concluded there is no autocorrelation between residuals (Schreiber-Gregory, 2018).

Table 16

Model summary of regression analysis considering cumulative data

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0.82[a]	0.68	0.67	0.38	
2	0.82[b]	0.68	0.67	0.39	
3	0.82[c]	0.68	0.67	0.39	1.58

a. Predictors: (Constant), Hierarchy, Adhocracy, Market, Clan

b. Predictors: (Constant), Hierarchy, Adhocracy, Clan

c. Predictors: (Constant), Hierarchy, Clan

d. Dependent Variable: Lean system

(Source: author)

Based on model 3 it can be stated the Clan, and Hierarchy variables made a significant unique contribution to the prediction of Lean system as a dependent variable; however, the Adhocracy and Market were not statistically significant. As presented by table 17, the standardized coefficient value of Clan variable was 0.52, $t > 1.96$, $p < 0.05$, and for Hierarchy variable was 0.38, $t > 1.96$, $p < 0.05$ (see table 17). Accordingly the regression equation can be considered "Lean = 0.94 + 0.42 (Clan) + 0.34 (Hierarchy)" for this mode.

Table 17

Coefficients of the regression model 3 for Lithuania and Iran cumulative data

Model 3	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	0.94	0.14		6.57	0.00		
Clan	0.42	0.04	0.52	9.49	0.00	0.53	1.87
Hierarchy	0.34	0.05	0.38	6.4	0.00	0.53	1.87

(Source: author)

By the above result, it can be accepted the $H_{1\text{-}1}$ and $H_{1\text{-}4}$ of the research hypothesizes related to Clan and Hierarchy culture types, and also rejected the $H_{1\text{-}2}$ and $H_{1\text{-}3}$ of the research hypothesizes related to Adhocracy and Market culture types.

3.6 Discussion

First, it is notable that hierarchy culture is perceived the most, and adhocracy culture is perceived the least by respondents in both countries, Lithuania and Iran. Surprisingly, this achieved result is against the claim of Kim and Chang (2019) in which stated the hierarchy culture has a narrow place in today's organizational ecology (Kim & Chang, 2019). By referring to the obtained data, most of half the surveyed companies were categorized in large size business. In addition, in most of them, it has been applying the lean system more than 3 years. Typically, large organizations are dominated by a hierarchy culture (Cameron & Quinn, 2011), and moreover, it should be mentioned most of the surveyed Lithuanian companies were international businesses which are located in this country for local or any international operations. Considering the possible effect of NC on how OC perceives and the power distance on the Hofstede NC model, Iran has been categorized as a hierarchical society; on the contrary, Lithuanians are willing to have equality and prefer decentralization of power and decision-making. However, there is hierarchical thinking among the old generation in Lithuania (HofstedeInsights, 2020). Worthy to note that as it has been mentioned earlier, in Paro and Gerolamo (2015)' study was concluded the hierarchy culture profile can be more compatible with lean principles compared to other OC types, and in the opposite point is the adhocracy Culture (Paro & Gerolamo, 2015). In another study, it was asserted that the features of hierarchy culture are included in the lean organizations (Mathew & Jones, 2013). Moreover, by referring to the CVF of the Cameron and Quinn model and some previous research such as Pakdil and Leonard (2015)'s study, it can be found a hierarchical cultural firm has more effective lean processes, in terms of control, standardization, and predictable performance outcome techniques (Pakdil & Leonard, 2015). By considering all the arguments, it may be explained the reason for observing the highest mean score for hierarchy among other OC types in Lithuanian and Iranian lean firms.

Secondly, it has been confirmed that OC has a significant impact on Lean system implementation, and observed a strong positive correlation between these two variables in both countries. As it was discussed earlier in the literature review, it has been mentioned about the culture as one main part or element of some proposed model or framework, or as the lost chain in lean system implementation directly or indirectly in many studies. For instance, it was stated the key factor for the sustainable lean system is human related one, and it needs to seek behind the changes in behavior and mentality of employees and leaders (Danese et al., 2018; Dombrowski & Mielke, 2013; Mann, 2009, 2014; Meier & Liker, 2005; Netland, 2016; Orr, 2005; Sebtaoui et al., 2020; Tortorella et al., 2020). In the model proposed by Dombrowski and Mielke (2013), it was

included improvement culture as one of five principles for sustainable lean implementation (Dombrowski & Mielke, 2013, 2014). In another research, it was found out OC as one of the four critical factors for the implementation of lean manufacturing within SMEs (Saad et al., 2006). With the same results in one more study, it was concluded that the one of the CSFs for lean transformation is culture and human related issue (Nordin et al., 2012). Also noteworthy is that, it was concluded that the companies with sustainable lean implementation experience have gone through the so-called lean evolution from the tool-based change to system-based and then cultural-based change (Hines et al., 2020). Therefore, it can be stated the achieved results are supported by the mentioned pervious researches. However, this result cannot explain the causality of the relationship between OC and lean, and it may be some other interfering and mediating variables in this relationship.

Moreover, it was observed that the features of the clan, adhocracy, and hierarchy culture types positively impact on the lean system implementation in both countries, while it could not find the similar impact by the market. However, taking into account all the data from the both countries, it was revealed that only the clan and hierarchy culture positively impact on the lean system. By referring to the CVF, it was proposed that a clan cultural firm has more effective lean processes, in terms of employee involvement and teamwork, and a hierarchical cultural firm has more effective lean processes, in terms of control, standardization, and predictable performance outcome techniques, also an adhocracy cultural firm has more effective lean processes, in terms of creativity, problem-solving processes, and decentralization (Pakdil & Leonard, 2015). Also, it has been mentioned the clan culture is a typical culture type of Japanese firms, and it has become noticeable the characteristics of this culture type for western organizations after finding successful performance of Japanese companies (Cameron & Quinn, 2011). It has been stated earlier that Paro & Gerolamo (2015) found the hierarchy as the highest percentage of conformity of culture type with lean principles and the clan and market on the next places (Paro & Gerolamo, 2015). In another research, it was observed that tight control and employee-oriented, professional, and open system approaches seem to align with lean (Erthal & Marques, 2018). However, it was observed neutral impact of hierarchy culture and clan culture on lean in other study and concluded the adhocracy culture is the most supportive OC type for the Lean system (Hardcopf & Shah, 2014). In another study, it was concluded if managers follow the clan and adhocracy cultures approach, the lean initiatives are more likely to succeed (Knapp, 2015). Moreover, it was observed the adhocracy and clan culture have a partial positive impact on some Lean items (Losonci et al., 2017). It, therefore, can be stated the achieved results are logical by considering and comparing to pervious research.

It was found similar results regarding the regression analysis and effective OC types on the lean system in both countries. By this result, it can be stated different NCs may not change how OC types impact upon the lean system. There is not much research about the relations of OC, NC, and lean to discuss deeply this result; however, by the one of the last relevant research it can be mentioned that it was found the high uncertainty avoidance, high collectivism, and long-term orientation are synchronized with principles of Lean (Erthal & Marques, 2018); and they asserted that OC is derived from managerial attitude and can play a positive and balancing role for lean adoption once it comes to some negative NC dimensions for lean implementation (Erthal & Marques, 2018). By considering these results and looking into the Hofstede results, it can be stated that each country has different positive and negative NC features for lean system implementation. For instance, Lithuania has a matched NC features with lean regarding the long-term orientation, and for Iran can be mentioned the collectivism features accordingly (HofstedeInsights, 2020). To discuss more, it can be compared the research result with the lean culture model proposed by Taherimashhadi and Ribas (2018).

As cited earlier about the lean culture model by considering the relationship between OC and NC in Taherimashhadi and Ribas (2018)'s research, it can be stated that "a sense of belonging to the organization" and "lively spirit orientation" dimensions of the defined model are compatible with the clan OC type perceived by regression analysis results. In addition, the hierarchy impact perceived by regression analysis results is compatible with the "performance orientation" dimension, and the adhocracy impact perceived by regression analysis results is matched with features of "low authority distribution", "the courage to accept changes", and "time perspective orientation" dimensions. Also noteworthy is that it was concluded that three key CSFs for lean implementation have been cultural and human-related issues, and a particular NC cannot change top-ten CSFs for lean implementation (Netland, 2016). Hence, it can be stated that although it can be found some effective features of NC on lean implementation positively or negatively, the management attitude and cultural circumstances of companies determine what kind of cultural approaches can be suitable for lean transformation and these similar results can be derived from this fact.

Last point but not least, it must be argued that whether the relationship between OC and lean is a one-way or two-way interaction. As it was discussed earlier, within the lean evolution, the lean concept has been developed into two main directions; philosophical and or strategic perspective, and practical perspective (Hines et al., 2004; Liker, 2004; Losonci & Demeter, 2013; Shah & Ward, 2007; Womack & Jones, 2003); and also in another perspective, it has been evolved from the tool-based to system-based and then cultural-based concept (Hines et al., 2020). Not only it

has been emphasized social-cultural aspects in the lean philosophy and strategy mentioned perspective but also can be found these such elements and human-related concerns among the proposed lean practices and models. In the used lean model in this research– 4P Liker or Toyota way model – it has been emphasized that the combination of its elements properly, which are philosophy, process, people, and problem-solving, can transform any organization into a Lean with Toyota's quality and efficiency-obsessed culture (Liker, 2004). In another word, this model has been developed to stress that lean tools and techniques are not the success secret of lean companies; their success is based on their ability to foster leadership, teams, and culture, to develop proper strategy, to boost supplier relationships, and to maintain a learning organization (Liker, 2004). It, therefore, may be stated the lean system like any other business system besides having promoted tools and techniques, have cultural components by itself in which can be called and found them in different ways such as philosophy, people, and problem-solving in the 4P Liker (2004) model. Furthermore, it may be stated that as the OC can be changed through top-level strategies, management approaches, and chosen practices, embracing the lean system may direct the OC in a lean way consequently.

CONCLUSIONS AND SUGGESTIONS

Taking into account previous researches and scientific literature available in which has been reported the high failure rate in lean system implementation, and additionally, pervious research findings reporting the human-related and cultural issues as the main CSFs for lean implementation, this study was performed to analyze the impact of organizational culture on the implementation of the lean system by focusing on two different statistical populations in two countries, Lithuania and Iran. The following conclusions can be asserted based on each research objective and its result.

Firstly, considering the first research objective - to identify concepts, models and dimensions of OC- through study of OC literature it can be concluded although there have been different approaches to define and conceptualize OC, most organizational scholars are unanimous that the main content of OC consists of the values, beliefs, and assumptions which are set by the members of an organization and different layers in which convey the norms and shared meaning to others through them. It has been asserted the different practices can be the effective way through the culture layers to make values, beliefs, and assumptions visible for people in an organization. The various approaches have caused to appear different models expressing different dimensions for culture by scholars, however, the main concern of all of them have been organizational outcomes and effectiveness. By many kinds of research, it has been proven the OC has a significant impact on organizational outcomes and effectiveness in a long-term perspective.

Concerning the second research objective - to identify concepts, principles and tools of lean system- through study of lean literature it can be stated that the lean system has expanded from the original application in vehicle manufacturers to various sectors even service-based organizations as an innovative strategy over the years. This system by focusing on value from the customer perspective and stressing wastes elimination can provide a competitive advantage for nowadays organizations. The lean concept has been developed into two main directions; philosophical and or strategic perspective, and practical perspective in order to provide appropriate directions in different circumstances and business sectors. In addition, it has been evolved from the tool-based to system-based and then cultural-based concept in order to emphasize social-cultural aspects and human-related concerns. This such evolution indicates that social-cultural and human-related issues are the main CSFs for lean system implementation and maintenance. That is why it can be found many frameworks and methodologies for lean implementation.

Concerning the third research objective - to identify the impact of OC types on lean system implementation - through analysis of previous OC- Lean studies it can be concluded OC plays a significant role within lean transformation in companies, and indeed it should be considered appropriate countermeasures and strategies to direct OC-lean interaction to the desired purpose. In another words, in step with some previous research, it can be assumed that cultural and human related issues are the main CSFs for lean system implementation; however, it was not found enough consensus among scholars that indicate which kinds of OC types or dimensions can have a strong impact on the Lean system implementation. Particularly in this research, based on the strong and positive correlation observed by Pearson test addressing the first research hypothesis, similar to previous research it can be stated that it needs to be fully considered cultural and human aspects during the lean system implementation. Consequently, it would be indispensable to find out what kinds of cultural features and strategies can be most useful to assuring sustainable lean transformation.

According to the obtained results by regression analysis addressing research hypotheses based on OC types, it can be concluded a balanced culture containing the feature of clan, hierarchy, and adhocracy culture types may be ideal for promoting lean principles and adopting them in organization smoothly. It can be indicated that the values and assumptions emphasizing in these three culture types are align with the lean system. Therefore, to develop and establish those core values and thoughts it may be necessary to deploy the proper practices in line with these three OC types features simultaneously to stimulate and be a sustainable implementation of the lean system in the organization. These such practices must be focused on people development affairs, process efficiency issues, and innovative thinking fostering.

Finally, concerning the last research objective - to compare the impact of OC types on the implementation of lean system between Lithuanian and Iranian organizations- due to observing the similar results on regression analysis for both countries, it can be concluded that there would not be any significant difference in OC types' features impact on the lean system comparing particular countries in this research in spite of different regions and NCs. In addition, it was observed the similar most culture perceived in these two countries despite differences in NCs. Hence, it can be stated that although it can be found some effective features of NC on lean implementation positively or negatively, the management attitude, chosen strategies, and targeted perspectives of companies determine what kind of cultural approaches can be suitable for lean transformation. In other words, it can be indicated that the companies direct to adopt similar cultural approaches to achieve the desired results in the lean journey regardless of the characteristics of national culture. As some previous researches have pointed out, it can be stated

that NC may not have a significant impact on the lean system and not be among the CSFs for lean transformation.

Implications for future research. This study has been performed for understanding the research problem at the specific time range with experts' and managers' perspectives in two different countries. Longitudinal research can be required to keep observe OC and its relationship to lean by which can provide how OC will evolve while maturing the lean system, or how the lean system will progress in given OC. Furthermore, as it has been mentioned earlier, there is not enough empirical research for examining the possible OC-Lean relationship and its interaction, therefore the second call for research can be to perform similar research in different region and countries and compare it with the reported findings in this research. Moreover, as it has been discussed the lean system is a combination of different components including the ones stem from a philosophical and strategic level and the ones stem from a practical and technical level so that it is contained with cultural and human-related elements. So, another research opportunity can be understanding the possible impact of the lean system on shaping OC, and also finding the causality between this possible relationship by controlling and interfering with different variables.

Implications for practice. Taking into account the reported high failure rate in lean implementation, cultural and human-related issue as the main challenge in lean transformation, and research findings regarding the features of clan, hierarchy, and adhocracy culture type, the note for leaders is to do not focus only on the lean tools and techniques, and pay attention to the cultural circumstances during lean transformation and even before beginning the implementation. It can be advised to leaders to assess the OC and find out the current OC profile in the first step, and strive to apply practices and strategies in line with the assumptions, orientations, values, and approaches of mixed culture of clan, hierarchy, and adhocracy types. In details, based on Cameron and Quinn's OC model, it can be recommended to establish a structured environment with stability, smooth functioning and efficiency, and to value standardized rules and procedures, and to foster coordinator and organizer managers. Simultaneously, it needs to be provided the human work environment by focusing on communication, employee development, and commitment, and to value teamwork, participation and consensus, and to develop the mentor and team builder manager. In addition, according to adhocracy features, it is necessary to promote the innovativeness and readiness for change and meeting new challenges. It must be encouraged leaders and staff to be risk-oriented, anticipate necessities, develop the standards, and improve the process continually. And also when needed it can be created any adhocratic subunits to escalate the processes for achieving preferred results.

Furthermore, it would be helpful to consider the positive and negative of the NC features of the country in relation to lean system implementation, and determine some proper countermeasures to mitigate the negative impact of NC features within the lean implementation, and exploit the positive NC features for amending the OC and implementing human and cultural strategies in line with lean practices. In addition, it is important to take into account the cultural and human-related principles factors in lean models such as the 4P Liker model and apply those and direct the OC to values emphasized in the lean culture. As Liker has stressed out, culture must support people engaging in lean transformation and must balance the role of people in organizational culture and values their continuous improvements, with a mechanism focused on high-value-added flow.

LIST OF REFERENCES

AlManei, M., Salonitis, K., & Xu, Y. (2017). Lean implementation frameworks: the challenges for SMEs. *Procedia Cirp, 63*, 750-755. doi:https://doi.org/10.1016/j.procir.2017.03.170,

Alvesson, M. (2011). Organizational culture. *Handb. Organ. Cult. Clim*.

Anand, G., & Kodali, R. (2010). Analysis of lean manufacturing frameworks. *Journal of Advanced Manufacturing Systems, 9*(01), 1-30. doi:https://doi.org/10.1142/S0219686710001776,

Bortolotti, T., Boscari, S., & Danese, P. (2015). Successful lean implementation: Organizational culture and soft lean practices. *International Journal of Production Economics, 160*, 182-201. doi:https://doi.org/10.1016/j.ijpe.2014.10.013,

Boscari, S., Danese, P., & Romano, P. (2016). Implementation of lean production in multinational corporations: A case study of the transfer process from headquarters to subsidiaries. *International Journal of Production Economics, 176*, 53-68. doi:https://doi.org/10.1016/j.ijpe.2016.03.013,

Boyce, A. S., Nieminen, L. R., Gillespie, M. A., Ryan, A. M., & Denison, D. R. (2015). Which comes first, organizational culture or performance? A longitudinal study of causal priority with automobile dealerships. *Journal of Organizational Behavior, 36*(3), 339-359. doi:https://doi.org/10.1002/job.1985,

Cameron, K. S., & Quinn, R. E. (2011). *Diagnosing and changing organizational culture: Based on the competing values framework*: John Wiley & Sons.

Chay, T., Xu, Y., Tiwari, A., & Chay, F. (2015). Towards lean transformation: the analysis of lean implementation frameworks. *Journal of manufacturing technology management*. doi:https://doi.org/10.1108/JMTM-10-2013-0143,

Coetzee, R., Van der Merwe, K., & Van Dyk, L. (2016). Lean implementation strategies: how are the Toyota Way principles addressed? *South African Journal of Industrial Engineering, 27*(3), 79-91. doi:http://dx.doi.org/10.7166/27-3-1641

Danese, P., Manfè, V., & Romano, P. (2018). A systematic literature review on recent lean research: state-of-the-art and future directions. *International Journal of Management Reviews, 20*(2), 579-605. doi:https://doi.org/10.1111/ijmr.12156,

Denison, D., Nieminen, L., & Kotrba, L. (2014). Diagnosing organizational cultures: A conceptual and empirical review of culture effectiveness surveys. *European Journal of Work and Organizational Psychology, 23*(1), 145-161. doi:https://doi.org/10.1080/1359432X.2012.713173,

Denison, D. R. (1990). *Corporate culture and organizational effectiveness*: John Wiley & Sons.

Denison, D. R., & Mishra, A. K. (1995). Toward a theory of organizational culture and effectiveness. *Organization science, 6*(2), 204-223. doi:https://doi.org/10.1287/orsc.6.2.204,

Denison, D. R., & Neale, W. (1996). Denison organizational culture survey, Facilitator Guide. *Ann Arbor, MI 48104 , Denison Consulting, LLC*.

Dombrowski, U., & Mielke, T. (2013). Lean leadership–fundamental principles and their application. *Procedia Cirp, 7*, 569-574. doi:https://doi.org/10.1016/j.procir.2013.06.034,

Dombrowski, U., & Mielke, T. (2014). Lean leadership–15 rules for a sustainable lean implementation. *Procedia Cirp, 17*, 565-570. doi:https://doi.org/10.1016/j.procir.2014.01.146,

Erthal, A., & Marques, L. (2018). National culture and organisational culture in lean organisations: a systematic review. *Production Planning & Control, 29*(8), 668-687. doi:https://doi.org/10.1080/09537287.2018.1455233,

Green, S. B. (1991). How many subjects does it take to do a regression analysis. *Multivariate behavioral research, 26*(3), 499-510. doi:https://doi.org/10.1207/s15327906mbr2603_7,
Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2014). Multivariate data analysis: Pearson new international edition. *Essex: Pearson Education Limited*.
Halling, B., & Renström, J. (2014). Lean leadership: a matter of dualism. *International Journal of Human Resources Development and Management, 14*(4), 242-253. doi:https://doi.org/10.1504/IJHRDM.2014.069355,
Hardcopf, R., & Shah, R. (2014). *Lean and performance: The impact of organizational culture.* Paper presented at the Academy of Management Proceedings.
Helfrich, C. D., Li, Y.-F., Mohr, D. C., Meterko, M., & Sales, A. E. (2007). Assessing an organizational culture instrument based on the Competing Values Framework: Exploratory and confirmatory factor analyses. *Implementation science, 2*(1), 13. doi:https://doi.org/10.1186/1748-5908-2-13,
Hernandez-Matias, J. C., Ocampo, J. R., Hidalgo, A., & Vizan, A. (2019). Lean manufacturing and operational performance. *Journal of manufacturing technology management*. doi:https://doi.org/10.1108/JMTM-04-2019-0140,
Hines, P., Holweg, M., & Rich, N. (2004). Learning to evolve. *International journal of operations & production management*. doi:https://doi.org/10.1108/01443570410558049,
Hines, P., Taylor, D., & Walsh, A. (2020). The Lean journey: have we got it wrong? *Total quality management & business excellence, 31*(3-4), 389-406. doi:https://doi.org/10.1080/14783363.2018.1429258,
Hofstede, G. (2001). *Culture's consequences: Comparing values, behaviors, institutions and organizations across nations*: Sage publications.
Hofstede, G. (2011). Dimensionalizing cultures: The Hofstede model in context. *Online readings in psychology and culture, 2*(1), 2307-0919.1014. Retrieved from http://scholarworks.gvsu.edu/orpc/vol2/iss1/8
HofstedeInsights. (2020). Country comparison tool. Retrieved from https://www.hofstede-insights.com/country-comparison/iran,lithuania/
Hogan, S. J., & Coote, L. V. (2014). Organizational culture, innovation, and performance: A test of Schein's model. *Journal of business research, 67*(8), 1609-1621. doi:https://doi.org/10.1016/j.jbusres.2013.09.007,
Holweg, M. (2007). The genealogy of lean production. *Journal of operations management, 25*(2), 420-437. doi:https://doi.org/10.1016/j.jom.2006.04.001,
Homburg, C., & Pflesser, C. (2000). A multiple-layer model of market-oriented organizational culture: Measurement issues and performance outcomes. *Journal of marketing research, 37*(4), 449-462. doi:https://doi.org/10.1509%2Fjmkr.37.4.449.18786,
IndustryWeek. (2016). *Future of Manufacturing: 2020 and Beyond*. Retrieved from https://www.nist.gov/system/files/documents/2016/11/16/iw_kronos_research_report_2016.pdf
Jung, T., Scott, T., Davies, H. T., Bower, P., Whalley, D., McNally, R., & Mannion, R. (2009). Instruments for exploring organizational culture: A review of the literature. *Public administration review, 69*(6), 1087-1096. doi:https://doi.org/10.1111/j.1540-6210.2009.02066.x,
Kallage, R. (2006). Lean implementation failures, why they happen, and how to avoid them. Retrieved from http://www.thefabricator.com/article/shopstrategies/lean-implementation-failures
Keough, W. (2012). The Toyota Way to Lean Leadership: Achieving and Sustaining Excellence Through Leadership Development [review]/Liker, Jeffery K. and Gary L. Convis. *Journal of Applied Christian Leadership, 6*(2), 135-136. Retrieved from https://digitalcommons.andrews.edu/jacl/vol6/iss2/13/

Khedhaouria, A., Nakara, W. A., Gharbi, S., & Bahri, C. (2020). The Relationship between Organizational Culture and Small-firm Performance: Entrepreneurial Orientation as Mediator. *European Management Review*. doi:https://doi.org/10.1111/emre.12383,
Kim, T., & Chang, J. (2019). Organizational culture and performance: A macro-level longitudinal study. *Leadership & Organization Development Journal*. doi:https://doi.org/10.1108/LODJ-08-2018-0291,
Knapp, S. (2015). Lean Six Sigma implementation and organizational culture. *International journal of health care quality assurance*. doi:https://doi.org/10.1108/IJHCQA-06-2015-0079,
Knol, W. H., Slomp, J., Schouteten, R. L., & Lauche, K. (2018). Implementing lean practices in manufacturing SMEs: testing 'critical success factors' using Necessary Condition Analysis. *International Journal of Production Research, 56*(11), 3955-3973. doi:https://doi.org/10.1080/00207543.2017.1419583,
Krafcik, J. F. (1988). Triumph of the lean production system. *MIT Sloan Management Review, 30*(1), 41.
Lacksonen, T., Rathinam, B., Pakdil, F., & Gülel, D. (2010). *Cultural issues in implementing lean production.* Paper presented at the IIE Annual Conference. Proceedings. Retrieved from https://search.proquest.com/openview/cff3797ae2860cbf71a6a13938caf1ef/1?pq-origsite=gscholar&cbl=51908
Li, S., Rao, S. S., Ragu-Nathan, T., & Ragu-Nathan, B. (2005). Development and validation of a measurement instrument for studying supply chain management practices. *Journal of operations management, 23*(6), 618-641. doi:https://doi.org/10.1016/j.jom.2005.01.002,
Liker, J. (2004). *The toyota way*: Esensi.
Liker, J., & Rother, M. (2011). Why lean programs fail. *Lean Enterprise Institute, 2011*, 45-79. Retrieved from http://www.essence-leadership.com/wp-content/uploads/2015/08/Why_Lean_Programs_Fail.pdf
Lim, B. (1995). Examining the organizational culture and organizational performance link. *Leadership & Organization Development Journal*. doi:https://doi.org/10.1108/01437739510088491,
Losonci, D., & Demeter, K. (2013). Lean production and business performance: international empirical results. *Competitiveness Review: An International Business Journal*. doi:https://doi.org/10.1108/10595421311319816,
Losonci, D., Kása, R., Demeter, K., Heidrich, B., & Jenei, I. (2017). The impact of shop floor culture and subculture on lean production practices. *International journal of operations & production management*. doi:https://doi.org/10.1108/IJOPM-11-2014-0524,
Lucey, J., Bateman, N., & Hines, P. (2004). Achieving pace and sustainability in a major lean transition. *Management Services, 48*(9), 8. Retrieved from https://www.researchgate.net/profile/Peter_Hines2/publication/285759052_Achieving_pace_and_sustainability_in_a_major_lean_transition/links/5accda5aaca2723a333e3994/Achieving-pace-and-sustainability-in-a-major-lean-transition.pdf
Lucey, J., Bateman, N., & Hines, P. (2005). Why major lean transitions have not been sustained. *Management Services, 49*(2), 9-13. Retrieved from https://www.researchgate.net/publication/285749699_Why_major_lean_transitions_have_not_been_sustained
Mann, D. (2009). The missing link: Lean leadership. *Frontiers of health services management, 26*(1), 15-26. Retrieved from https://journals.lww.com/frontiersonline/Abstract/2009/07000/The_Missing_Link__Lean_Leadership.3.aspx
Mann, D. (2014). *Creating a lean culture: tools to sustain lean conversions*: CRC Press.
Marodin, G. A., & Saurin, T. A. (2013). Implementing lean production systems: research areas and opportunities for future studies. *International Journal of Production Research, 51*(22), 6663-6680. doi:https://doi.org/10.1080/00207543.2013.826831,

Mathew, S. K., & Jones, R. (2013). Toyotism and Brahminism. *Employee Relations*. doi:https://doi.org/10.1108/01425451311287871,
Meier, J. K. L. D. P., & Liker, J. (2005). *Toyota talent*: McGraw-Hill, New York.
Mirdad, W. K., & Eseonu, C. I. (2017). A cause-effect strategy map for lean process transformation. *International Journal of System of Systems Engineering, 8*(2), 121-146. doi:https://doi.org/10.1504/IJSSE.2017.088445,
Monden, Y. (2011). *Toyota production system: an integrated approach to just-in-time*: CRc Press.
Naranjo-Valencia, J. C., Jiménez-Jiménez, D., & Sanz-Valle, R. (2016). Studying the links between organizational culture, innovation, and performance in Spanish companies. *Revista Latinoamericana de Psicología, 48*(1), 30-41. doi:https://doi.org/10.1016/j.rlp.2015.09.009,
Netland, T. H. (2016). Critical success factors for implementing lean production: the effect of contingencies. *International Journal of Production Research, 54*(8), 2433-2448. doi:https://doi.org/10.1080/00207543.2015.1096976,
Nordin, N., Deros, B. M., Wahab, D. A., & Rahman, M. N. A. (2012). A framework for organisational change management in lean manufacturing implementation. *International Journal of Services and Operations Management, 12*(1), 101-117. doi:https://doi.org/10.1504/IJSOM.2012.046676,
Ohno, T. (1988). *Toyota production system: beyond large-scale production*: crc Press.
Orr, C. (2005). *Lean leadership in construction.* Paper presented at the 13th International Group for Lean Construction Conference: Proceedings. Retrieved from https://search.informit.com.au/documentSummary;dn=565392600881852;res=IELENG
Osono, E., Shimizu, N., & Takeuchi, H. (2008). *Extreme Toyota: Radical contradictions that drive success at the world's best manufacturer*: John Wiley & Sons.
Pakdil, F., & Leonard, K. M. (2015). The effect of organizational culture on implementing and sustaining lean processes. *Journal of manufacturing technology management*. doi:https://doi.org/10.1108/JMTM-08-2013-0112,
Pakdil, F., & Leonard, K. M. (2017). Implementing and sustaining lean processes: the dilemma of societal culture effects. *International Journal of Production Research, 55*(3), 700-717. doi:https://doi.org/10.1080/00207543.2016.1200761,
Pallant, J. (2013). *SPSS survival manual. McGraw-Hill Education (UK).*
Paro, P. E., & Gerolamo, M. C. (2015). Diagnosing and understanding the ideal Lean Culture-based on the 14 principles of the Toyota Way. *Global Journal on Humanities and Social Sciences, 1*(2). Retrieved from http://archives.un-pub.eu/index.php/pntsbs/article/viewArticle/3734
Pay, R. (2008). Everybody's jumping on the lean bandwagon, but many are being taken for a ride. *Industry Week, 5*, 21-23. Retrieved from https://www.rpaycompany.com/industry/pdf/LeanBandwagon.pdf
Pinho, J. C., Rodrigues, A. P., & Dibb, S. (2014). The role of corporate culture, market orientation and organisational commitment in organisational performance. *Journal of Management Development*. doi:https://doi.org/10.1108/JMD-03-2013-0036,
Prajogo, D. I., & McDermott, C. M. (2011). The relationship between multidimensional organizational culture and performance. *International journal of operations & production management*. doi:https://doi.org/10.1108/01443571111144823,
Ramarapu, N. K., Mehra, S., & Frolick, M. N. (1995). A comparative analysis and review of JIT "implementation" research. *International journal of operations & production management*. doi:https://doi.org/10.1108/01443579510077188,
Rother, M. (2009). *Toyota kata*: McGraw-Hill Professional Publishing New York, NY.
Rother, M., & Shook, J. (2003). *Learning to see: value stream mapping to add value and eliminate muda*: Lean Enterprise Institute.

Saad, S., Perera, T., Achanga, P., Shehab, E., Roy, R., & Nelder, G. (2006). Critical success factors for lean implementation within SMEs. *Journal of manufacturing technology management*. doi:https://doi.org/10.1108/17410380610662889,
Sackmann, S. A. (1991). Uncovering culture in organizations. *The Journal of applied behavioral science, 27*(3), 295-317. doi:https://doi.org/10.1177%2F0021886391273005,
Sartal, A., Vázquez, X. H., & Lozano-Lozano, L. M. (2020). Organizational tools and cultural change in the success of lean transformations: Delving into sequence and rhythm. *IEEE Transactions on Engineering Management*. doi:https://doi.org/10.1109/TEM.2020.3001116,
Schein, E. H. (2010). *Organizational culture and leadership* (Vol. 2): John Wiley & Sons.
Schonberger, R. J. (2008). *World class manufacturing*: Simon and Schuster.
Schreiber-Gregory, D. (2018). Logistic and Linear Regression Assumptions: Violation Recognition and Control. *Henry M Jackson Foundation*. Retrieved from https://analytics.ncsu.edu/sesug/2018/SESUG2018_Paper-247_Final_PDF.pdf
Sebtaoui, F. E., Adri, A., & Rifai, S. (2020). Literature review on successful JIT implementation: benefits, obstacles and critical success factors. *International Journal of Logistics Systems and Management, 37*(2), 153-172. doi:https://doi.org/10.1504/IJLSM.2020.110571,
Shah, R., & Ward, P. T. (2003). Lean manufacturing: context, practice bundles, and performance. *Journal of operations management, 21*(2), 129-149. doi:https://doi.org/10.1016/S0272-6963(02)00108-0,
Shah, R., & Ward, P. T. (2007). Defining and developing measures of lean production. *Journal of operations management, 25*(4), 785-805. doi:https://doi.org/10.1016/j.jom.2007.01.019,
Shingo, S., & Dillon, A. P. (1989). *A study of the Toyota production system: From an Industrial Engineering Viewpoint*: CRC Press.
Sim, K. L., & Rogers, J. W. (2009). Implementing lean production systems: barriers to change. *Management research news*. doi:https://doi.org/10.1108/01409170910922014,
Sisson, J., & Elshennawy, A. (2015). Achieving success with Lean. *International Journal of Lean six sigma*. doi:https://doi.org/10.1108/IJLSS-07-2014-0024,
Spear, S., & Bowen, H. K. (1999). Decoding the DNA of the Toyota production system. *Harvard business review, 77*, 96-108. Retrieved from https://i9y8y5w2.stackpathcdn.com/wp-content/uploads/2015/12/Decoding-DNA-Spear-Bowen.pdf
Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics: International edition*.
Taherimashhadi, M., & Ribas, I. (2018). A Model to align the organizational culture to Lean. *Journal of Industrial Engineering and Management, 11*(2), 207-221. doi:http://dx.doi.org/10.3926/jiem.2511,
Tortorella, G. L., Fettermann, D., Fogliatto, F. S., Kumar, M., & Jurburg, D. (2020). Analysing the influence of organisational culture and leadership styles on the implementation of lean manufacturing. *Production Planning & Control*, 1-13. doi:https://doi.org/10.1080/09537287.2020.1799255,
Trenkner, M. (2016). Implementation of lean leadership. *Management, 20*(2), 129-142. doi:https://doi.org/10.1515/manment-2015-0055,
Van den Berg, P. T., & Wilderom, C. P. (2004). Defining, measuring, and comparing organisational cultures. *Applied Psychology, 53*(4), 570-582. doi:https://doi.org/10.1111/j.1464-0597.2004.00189.x,
VanVoorhis, C. W., & Morgan, B. L. (2007). Understanding power and rules of thumb for determining sample sizes. *Tutorials in quantitative methods for psychology, 3*(2), 43-50. doi:https://doi.org/10.20982/TQMP.03.2.P043,
Wangwacharakul, P., Berglund, M., Harlin, U., & Gullander, P. (2014). Cultural aspects when implementing lean production and lean product development–experiences from a

Swedish Perspective. *Quality innovation prosperity*, *18*(1), 125-140. doi:http://dx.doi.org/10.12776/qip.v18i1.321,
Warrick, D., Milliman, J. F., & Ferguson, J. M. (2016). Building high performance cultures. *Organizational Dynamics*, *1*(45), 64-70. doi:http://dx.doi.org/10.1016%2Fj.orgdyn.2015.12.008,
Warrick, D. D. (2017). What leaders need to know about organizational culture. *Business Horizons*, *60*(3), 395-404. doi:https://doi.org/10.1016/j.bushor.2017.01.011,
Wilson, L. (2010). *How to implement lean manufacturing*: McGraw-Hill New York.
Womack, J. P., & Jones, D. T. (2003). *Lean Thinking: Banish Waste and Create Wealth in Your Corporation*: Free Press; 2nd edition (June 1, 2003).
Womack, J. P., Jones, D. T., & Roos, D. (2007). *The machine that changed the world: The story of lean production--Toyota's secret weapon in the global car wars that is now revolutionizing world industry*: Simon and Schuster.
Yadav, V., Jain, R., Mittal, M. L., Panwar, A., & Lyons, A. C. (2019). The propagation of lean thinking in SMEs. *Production Planning & Control*, *30*(10-12), 854-865. doi:https://doi.org/10.1080/09537287.2019.1582094,
Yu, T., & Wu, N. (2009). A review of study on the competing values framework. *International journal of business and management*, *4*(7), 37-42. doi:https://doi.org/10.5539/ijbm.v4n7p37,
Zhang, X., & Li, B. (2013). Organizational culture and employee satisfaction: An exploratory study. *International journal of trade, Economics and Finance*, *4*(1), 48. doi:https://doi.org/10.7763/IJTEF.2013.V4.259,

SUMMARY IN LITHUANIAN

ORGANIZACINĖS KULTŪROS ĮTAKA *LEAN* SISTEMOS ĮGYVENDINIMUI

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Magistro darbas

Globalaus verslo ir ekonomikos magistro programa

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Šio magistro darbo tikslas buvo ištirti, kokia organizacinės kultūros ir jos tipologijų įtaka Lean sistemos įgyvendinimui Lietuvos ir Irano organizacijose. Šis tikslas svarbus, nes viena vertus Lean sistema yra naudojama kaip novatoriška, konkurencinga strategija visame pasaulyje, o kita vertus dalis Lean pritaikymų nebuvo sėkmingi, o pritaikymų sėkmė skirtinguose regionuose buvo skirtinga. Remiantis ankstesniais tyrimais, su organizacijos kultūra susiję iššūkiai buvo vieni iš pagrindinių kritinių veiksnių, lemiančių sėkmę arba nesėkmę taikant Lean sistemą.

Šis tyrimas buvo atliktas taikant apklausą, paremtą Camerono, Quinno (2011) konkuruojančių vertybių modeliu ir Likerio modeliu 4P. Apklausoje sudalyvavo vadovai ir ekspertai, kurie buvo susipažinę su Lean sistema ir taikė ją organizacijose. 102 atsakymai buvo gauti iš Lietuvos organizacijų, 101 atsakymas – iš Irano organizacijų. Gauti duomenys buvo statistiškai apdoroti taikant faktorinę analizę ir daugialypę regresiją naudojant SPSS programinę įrangą.

Atliktas tyrimas atskleidė, kad organizacinės kultūros stiprumas daro didelę įtaką Lean sistemos taikymui; ir Lietuvoje, ir Irane ši įtaka buvo teigiama. Taipogi, buvo nustatyta, kad klano, hierarchijos ir adhokratijos kultūros tipai teigiamai veikė Lean sistemos įgyvendinimą abiejose šalyse, tuo tarpu rinkos kultūros tipo poveikis buvo nereikšmingas.

Remiantis šio tyrimo rezultatais galima padaryti išvada ir rekomenduoti, kad taikant Lean ypatingas dėmesys turėtų būti skirtas su klano, hierarchijos ir adhokratijos kultūros tipais susijusioms vertybėms ir būtų parinktas tinkamas taikymo būdas, atsižvelgiant į šiuos tris organizacinės kultūros tipus.

SUMMARY IN ENGLISH

IMPACT OF ORGANIZATIONAL CULTURE ON IMPLEMENTATION OF LEAN SYSTEM

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Master Thesis

Global Business and Economics master program

Faculty of Economics and Business Administration, Vilnius University

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The main purpose of this master thesis is to find out which kinds of organizational culture types and cultural features may impact on the implementation of the lean system positively by considering and comparing Lithuanian and Iranian organizations.

This is aiming due to the fact that the lean system has been adopting as an innovative competitive strategy all over the world; however, some of those such efforts have not been successful, and it has been reported many lean failure experiences in different regions noticeably; so that based on previous research, the human-related and cultural issues have been among the main critical factors to success or failure in lean transformation.

To perform this study, through the literature analysis, the research was carried out by applying quantitative approach through a survey using CVF of Cameron and Quinn model (2011) and 4P model of Liker (2004). It was targeted towards the managers and experts who are familiar with the lean system and engaged in lean implementation in their companies in both countries. 102 samples were obtained from Lithuanian companies, and 101 from Iranian companies. The obtained data were statistically processed by Exploratory Factor Analysis and multiple regression test with the SPSS software.

The performed research revealed that OC has a significant impact on implementation of Lean system, and observed a strong positive correlation between these two variables in both countries. In addition, it was observed that the features of the clan, hierarchy, and adhocracy culture types positively impact on the lean system implementation in both countries identically, while it did not show a similar impact for the market culture type.

According to research results and objectives, it was concluded and recommended that the values and assumptions emphasizing in the clan, hierarchy, and adhocracy culture types are aligned with the lean system, and it needs to select the proper practices by considering all these three OC types features simultaneously to stimulate the organization to move toward the lean way.