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ELABORATING AND VALIDATING UNIFIED LEAN CULTURE MODEL

The interpretation of ‘lean production’ has been slowly shifting from technical to socio-technical aspects since its appearance. This is well illustrated by the growing number of expressions associated with lean like ‘lean management’ and ‘lean thinking’. Seeking more advanced and at the same time more successful ways of lean implementation, researchers and practitioners discovered that carefully adding human, behavioural, management, leadership and many other soft elements in the lean melting-pot, will most likely improve application results. Still, despite all the efforts made, the socio-technical definition of lean is still blurry, researcher-dependent and mostly not confirmed by evidence. This study introduces a unified, cultural definition of lean integrating the culture model of Schein and the lean model from Modig and Åhlström. It shows that lean could be interpreted in different abstraction levels, as basic underlying assumptions, espoused values, methods and tools, giving an interrelated definition for each. The study also presents the findings of an empirical quantitative questionnaire research verifying the ‘lean culture’ definition and identifying correlations between ‘lean culture’, corporate competitiveness and corporate characteristics, based on information from 193 participating Hungarian medium and large sized industrial companies. The data show that the underlying assumptions of lean culture named Objective waste elimination, System level rationalization and Vision is improvement are significantly correlated with the components of corporate competitiveness. The findings draw attention to the soft, cultural side of lean production implementation and give practical advice on methods how to shape and control the cultural aspects of the implementation process to improve the chances of success.

Introduction

The phrase “lean production” (LP) was created by Krafcik in 1986 (Krafcik, 1986) and became widely known and recognized thanks to the success of the book *The Machine that Changes the World* (Holweg, 2006). LP, often referred as the western version of the Toyota Production System can be interpreted in a hard approach, purely as a production system, a set of tools and techniques (e.g. changeover time reduction, pull system, Andon), a method for production that delivers outstanding operating results (Shingo, 1999). However, there is a relatively strong consensus, that LP can also be interpreted in a soft-hard approach, as a system that has philosophical, management and behavioural aspects, that support the use of lean tools and techniques to reach their full potential (Womack & Jones, 1996) (Shah & Ward, 2003) (Hines, Holweg, & Rich, 2004) (Takeuchi, Osono, & Shimizu, 2008) (Báthory, 2011). The mixture of soft-hard approach represents the mainstream perception of LP and considered to be valid. Some, but relatively few researchers go further, and state that LP is not only tools and techniques with the supportive philosophical and management background, but a specific type of organizational culture that could be described through specific characteristics. (Anand & Kodali, 2010) (Modig & Åhlström, 2012) (Toarniczky et al., 2012) (Losonci et al., 2017). This approach is quite appealing as researchers most often identify organizational cultural issues as the main cause behind LP implementation failures (Friel, 2005) (Benders & Slomp, 2009) (Jenei, 2010). In other words, empirical research built around LP as a type of organizational culture seemingly opens the opportunity to find significant improvement in LP implementation practices and so, deserves further attention.

The main goal of this study is to contribute to this field of research by finding or creating and validating an own lean culture definition. The goal statement consists of two main parts that both have their own significance.

The first part is finding or creating a lean culture definition, or in other words, to provide an explanation that interprets lean production in a broader sense. This would put the tools and methods of lean production in the context of organizational culture or in a wide range of further organizational characteristics. It also has to be able to explain the difficulties often arising through lean production implementations. By this, the lean culture definition would allow companies to govern their lean implementations in a more comprehensive way. Besides this, the definition for lean implementation also has to be provided. This term is often used in the literature and among practitioners as a general concept.

However this might lead to confusion without specifying detailed characteristics for it, while the lean culture definition would be difficult to put in practice without a definition for lean implementation.

The second part of the goal statement is to validate the lean culture definition. For this, on one hand, the structure of the elements in the lean culture definition has to be validated. This is important for understanding the interrelationships between specific elements of lean culture and other organizational characteristics. On the other hand, the basic aim of organizations to improve their competitiveness by lean production (Demeter & Losonci, 2011) has to be taken into consideration. Otherwise, the validation would not be useful for practitioners. Therefore, during the validation process, the relationships between lean culture and corporate competitiveness have to be assessed. Positive outcomes would prove the appropriateness of the lean culture definition while they would also encourage practitioners to use the lean culture model for their implementations.

During the next chapters, existing lean culture approaches are taken into account, then, combining the gathered knowledge, a lean culture model is formulated. Afterwards the characteristics and results of an empirical research aiming to validate the lean culture model are shown.

Lean culture – literature review

First, the interpretations of lean culture found in literature are listed and the methods that researchers used for their own definitions are analysed to develop the conclusions for this study.

Interpretation of lean culture

The expression culture is widely used together with LP, but often as a comprehensive word that covers most aspects of organizational behaviour, philosophy, thinking, ideologies, decisions, management styles and so on (Browaeys & Fisser, 2012) (Mann, 2005) (Radnor et al., 2006). These express the importance of lean culture while not defining lean culture precisely. Many researchers recognize the lack of a clear lean culture definition and evolve their own approach by giving a specific list of elements or keywords that describe the characteristics of lean culture (Dennis, 2002) (Miller, 2005) (Toarniczky et al., 2012).

The main criticism for these is that it is not clear what these keywords are referring to. It is not clear if they could be applied at the same level of abstraction or if they are connected to each other in some ways. For example, Toarniczky et al. (2012, p. 109) lists 'meetings', 'tolerating failures' and 'leading by example' as characteristics of lean culture. However, the former can be considered as a commonly used technique at every company, the middle as a specific managerial behaviour and the latter as a general managerial behaviour. This inconsistency in these models makes understanding and its practical use very difficult. A few researchers try to overcome this obstacle by creating a hierarchical model, but they do not use the expression lean culture for their approach (Hines, Holweg, & Rich, 2004) (Anand & Kodali, 2010) (Modig & Åhlström, 2012).

A common criticism for all the listed types of lean culture definitions are that they do not rely on the extensive knowledge pool of organizational culture literature (Losonci et al., 2017). By this, they neglect the enormous knowledge and experience gathered by researchers since the beginning of the extensive organizational culture research that started in the 1980's (Sackmann, 1991). Still, there are a few attempts trying to combine LP and the organizational culture knowledge in order to define lean as a culture (Losonci et al., 2017), these are introduced and analysed in the next chapters.

Utilizing well known organizational culture assessment tools to define lean culture

The starting point of these researches is to use well known and scientifically accepted assessment tools to measure organizational culture dimensions at lean user and at non-lean user companies in order to identify differences, and by this, to identify the main characteristics of lean culture. Gelei et al. (2013) found, that the management styles of a lean practitioner and traditional companies are almost the same, and where differences could be found, they conflict with well-known lean principles/keywords. In the study of Toarniczky et al. (2012) a questionnaire measuring lean culture characteristics was used in an empirical research, but analysing the results, lean culture could not be identified. Shop floor subcultures of a company was analysed by Losonci et al. (2017) using the Competing Values Framework (CVF) created by Cameron and Quinn, finding only partial correlations between CVF dimension and usage of LP tools, which was not sufficient for defining lean culture.

As it was shown, empirical researches trying to utilize mature organizational culture assessment tools to define lean culture could not deliver satisfying results. Analysing the studies, two common points could be identified that are responsible for this lack of success:

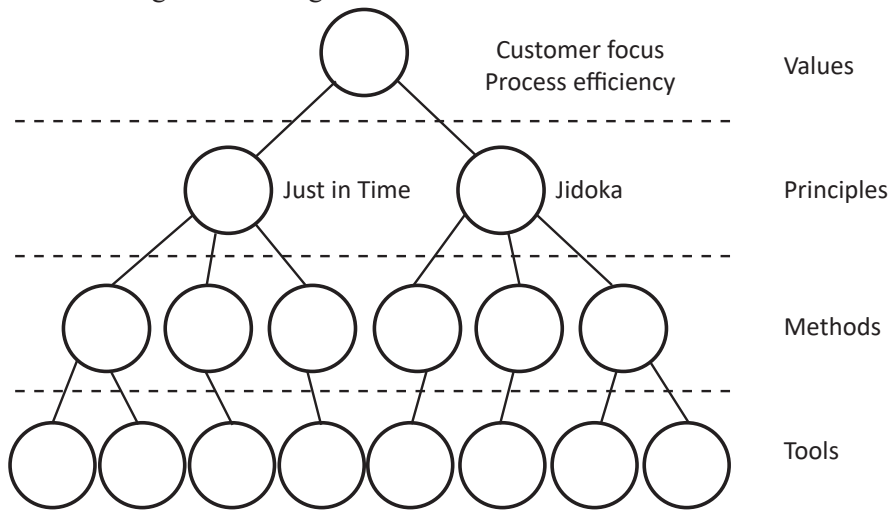
- Using maturity level of lean tools as an independent variable in the research model (Gelei et al. 2013) (Losonci et al., 2017): The models measure the maturity level of lean tools at the examined companies, and group companies based on the received values. In other words, the models consider that a company is lean if it is using lean tools and a company is non-lean if it is not using lean tools. However, LP implementation experiences show that a lean tool could be applied for and against lean principles (Narusso, 1991). In both cases, the answerers would give a high maturity rating for the relating question, even while there is a big chance that their organizational cultures were hugely different.
- Elements of possible lean culture are defined in a one-sided manner (Gelei et al. 2013) (Toarniczky et al., 2012): Researchers give predominantly one-sided or self-evident presumptions for lean culture. Many characteristics of lean culture they evaluate do not have a valid opposition. For instance, one of the researches defines responsibility as a feature characteristic of lean culture (Toarniczky et al., 2012, p. 109). That means that if a company is not lean, their workers would be irresponsible, which is very hard to accept and interpret at any company. No employee of any company would rate themselves as irresponsible no matter if they are lean or not. Or in other sense, if LP was so self-evident, every company would be lean, which is clearly not the case (Modig & Åhlström, 2012).

Combining organizational culture and LP knowledge

A lean culture definition combining relevant organizational culture and lean knowledge could not be found during the literature review. However, even though not using the expression lean culture, and also not using any relevant organizational culture knowledge in an explicit way, the lean model ('This is lean' model) from Modig & Åhlström (2012) mostly fulfils these criteria (Figure 1).

In the 'This is lean' model, LP is interpreted and defined on different levels of abstraction (Values, Principles, Methods, Tools). The connection between levels symbolizes that all elements should be aligned with each other, and not just theoretically, but also in practice.

From LP perspective, the ‘This is lean’ model is mostly built on relevant LP knowledge as the book pays a great attention for analysing and demonstrating a key element of LP, the focus is on process efficiency. However, the values level of the model could be criticised as one of the values, customer focus is included based on a personal interview, not based on a thorough research, so it is probably that some other values might be missing.



Uncovering the Levels of Culture

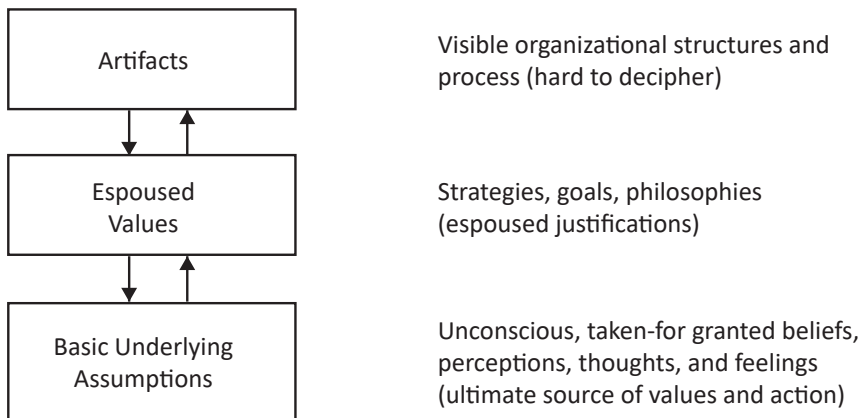


Figure 1 Modig and Åhlström’s ‘This is lean’ model
 Source: self edited (Modig & Åhlström, 2012, p. 138)
 and Schein’s organizational culture model; Source: self edited (Schein, 2004, p. 26)

From an organizational culture perspective, though the authors do not express it, the model's structure shows deceptive resemblance to Schein's organizational culture model. The meaning of Methods and Tools; Principles; Values from 'This is lean' model are practically equivalent to Artefacts; Espoused Values; Basic Underlying Assumptions in Schein's model respectively, while, the connection, interdependence of the model elements are interpreted in the same way at both cases. (Modig & Åhlström, 2012) (Schein, 2004). To sum up, the structure of the LP definition of Modig and Åhlström could be interpreted as a structure for a lean culture definition.

Conclusions of the lean culture literature review

The main conclusions from the studies trying to define lean culture through using well known organizational culture assessment tools are the following:

- Measuring the maturity of LP through assessing the use of lean tools should not be done by quantitative surveys using standardized questionnaires due to possible interpretation issues.
- The definition of basic lean culture elements must be created in a way that its opposite is a viable, interpretable and valid.

The main conclusions from the studies trying to combine organizational culture and LP knowledge are the following:

- The structure and logic of the 'This is lean' model could be used to define lean culture, because it is compatible with one of the most accepted organizational culture model, Schein's model.
- The elements, especially the Values level of the 'This is lean' model should be revised through a comprehensive analysis of LP literature.

The unified lean culture model created based on the findings listed is presented in the next chapter.

Elaborating the unified lean culture model (lean culture model)

The basis of the model is the ‘This is lean’ model from Modig & Åhlström (2012). As its structure is compatible with Schein’s organizational culture model, the basic structure itself is not transformed, but some changes are made. The top two levels of the ‘This is lean’ model were renamed according to the nomenclature used in Schein’s model. The labels Values; Principles were substituted for Artefacts; Espoused values respectively, while labels for Tools and Methods remained unchanged. Also, model was rotated by 180 degrees so that the order of levels would reflect the Schein model’s order of levels (Figure 2).

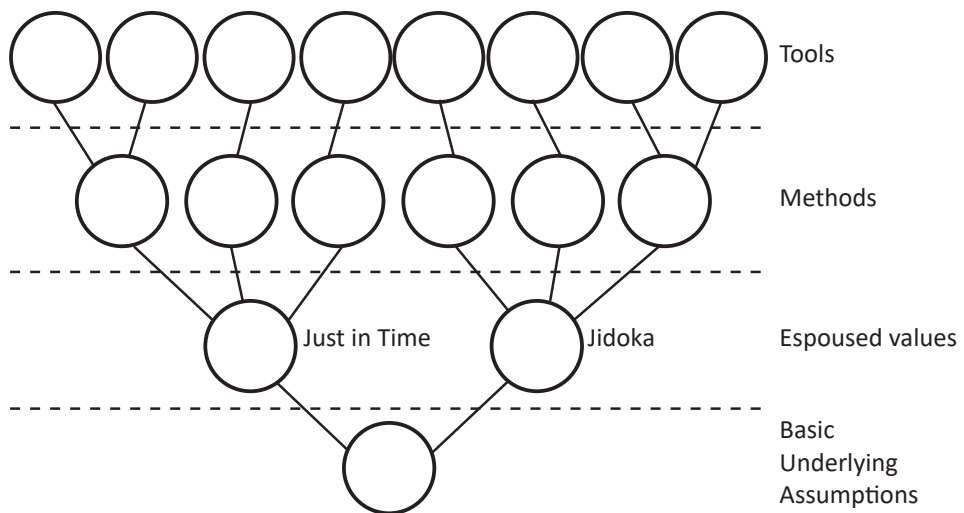


Figure 2 The structure of the unified lean culture model

Source: self edited

In the next step, a definition to all levels of the model was formulated. The most difficult part of this is the definition for Basic Underlying Assumptions because as Schein describes, these are unconscious, taken-for-granted beliefs, perceptions, thoughts and feelings. However, Schein also describes two processes in relation of Basic Underlying Assumptions and Espoused Values that help overcoming the difficulties. The Basic Underlying Assumptions unconsciously define which Espoused Values could be valid for a specific organizational culture, and if an Espoused Value remains unquestioned, unchallenged for a long time, it will become a Basic Underlying Assumption (Schein, 2004).

Defining the model elements

Taking all aspects into consideration, five lean culture Basic Underlying Assumptions (later used simply as lean assumptions) were identified through a comprehensive qualitative LP literature analysis (Péczely, 2017). During this process, Espoused Values of LP were identified and then grouped based on similarities in their characteristics taking into consideration that according to Schein, the common features of the Espoused Values within a group would specify the characteristics of the Basic Underlying Assumptions (Schein, 2004). At the end, a name and definition for each group was formulated, paying attention that the opposite of the definition would be still be valid.

This process resulted in the following five lean assumptions:

- **Comprehensive thinking:** Employees of the company are thinking at whole company and supply chain level. They strive to do their job in a fashion that they provide maximal help and benefit for the other organizational actors. They establish corporate systems and operation according to this principle.
- **Waste-oriented thinking:** The employees of the company are only willing to do jobs that are useful and valuable from the customer perspective. As a result, they are self-critical towards their own work, and continuously strive to find and visualize wastes that do not fit into this picture. They eliminate identified wastes in teamwork, where they perform detailed analysis to understand and solve root causes in order to find a solution that prevents reoccurrence.
- **Continuous improvement:** The employees of the company are actively participating in improving their own work and in the broader sense, the operation of the company. Utilizing their creativity, they signal if they find an opportunity for improvement, but they do not make hasty decisions, they chose the right solution after a careful consideration of all possible options. All systems in the company are created in a way that they represent the need for improvement.
- **Respect for human resources:** The employees of the company respect both the physical and intellectual productive forces of every people. The physical respect is realized in ergonomic, easy to work, comfortable workplaces and processes. The intellectual respect is realized through treating people as creative companions, who are able and willing to learn and develop. Therefore the employees share information, ask and hear each other's opinion and get empowered through involvement in tasks.

- Future orientation: The employees of the company prefer long term objectives at decision making, even against short term financial goals, knowing that this is the guarantee for the long term prosperity and survival of their company.

For defining the level of Espoused Values, the definitions from Modig and Åhlström (2012) were accepted:

- Just in Time: the aim to create Flow in each organizational process.
- Jidoka: the aim to reveal cases where Flow is interrupted and start a countermeasure to restore the Flow.

For Methods and Tools a joint definition has been created:

- Every operational development technique and its materialization that transmit the values of one or more lean assumptions.

At the end, the process of lean culture implementation was also defined:

- Every project or continuous activity consciously using lean tools and methods, as a result of which company characteristics change towards lean assumptions.

Defining the opposite of the lean assumptions

As it was found during the literature review, the basic elements of the lean culture can be considered valid if the opposite of them is applicable and interpretable. As in the lean culture model, every level of hierarchy is derived from the lean assumptions; an opposite definition is given for these.

- Silo thinking (the opposite of Comprehensive thinking): Employees of the company are thinking at the level of their own work, responsibilities. They strive to do their job in a fashion that they provide maximal benefits for their organizational unit not taking further organizational actors into consideration. They establish local systems and operation according to this principle.
- Symptom-treatment thinking (the opposite of Waste-oriented thinking): The employees of the company are only willing to do jobs that are useful and valuable from the perspective of the company management. As a result, their main goal is to meet their manager's expectations. If that is not achieved, a fast problem-solving process is started aiming to treat the visible symptoms.

- Operational focus (the opposite of Continuous improvement): The employees of the company focus on completing their own work at their best in order to maintain flawless operation. Finding and exploiting possibilities for improvement is the task of a dedicated team of professionals, who possess all the necessary technical and technological knowledge. All systems in the company are created in a way that they represent the need for flawless operation.
- Norm thinking (the opposite of Respect for human resources): The employees of the company consider human workforce as a resource that has to be used as efficiently as possible. As a result they build sophisticated norm and measurement systems to control labour effectiveness and expect workers to meet the required goals.
- Present orientation (the opposite of Future orientation): The employees of the company prefer short term objectives at decision making, taking only short term, often financial goals into consideration knowing that this is the guarantee for maximizing immediate gains.

The next chapters show how the validity of the lean culture model has been tested through an empirical research.

The method of the research

The chapter defines the cornerstones, boundaries and main characteristics of the research planned.

The goal of the research and consequences

The main goal is to validate the lean culture model through quantitative empirical research. For this, the research is focused on examining the lean assumptions level of lean culture model. Omitting other levels of the model from the research is justified by solid reasons, while it also carries some risks. The reasons for and against this decision are listed below.

Reasons for:

- Each other elements of the lean culture model are derived from the lean assumptions
- The connections between lean assumptions and other levels in the lean culture model are validated by the qualitative research made during the LP literature review
- Helps to avoid the difficulties arising during the measurement of lean tools and methods
- Helps to keep the research focused on the key topics drawn up during the definition of goals

Reasons against:

- The interrelationships between lean assumptions and other levels of the lean culture model were not tested and proved empirically, and thus, might be the result of subjective aspects of analysis used during the qualitative research. The clarification of this issue is a subject of future research.

Considering the reasons listed, it has been decided that the research is focuses on the examination of lean assumptions and results are extrapolated to lean culture.

Research questions

To validate the lean culture model, the following research questions (RQ) have to be answered about lean assumptions:

- RQ1: Can the composition and interpretation of lean assumptions be validated?
- RQ2: Does the presence of the lean assumptions at a company's organizational culture significantly positively influence its competitiveness?
- RQ3: Does the presence of the lean assumptions significantly influence the company's operational characteristics?
- RQ4: Does the presence of the lean assumptions significantly influence the organizational cultural characteristics?

RQ1 is self-explanatory; the lean culture model was created based on qualitative research and therefore has to be confirmed by quantitative evidence.

Through RQ2, the validity of the model is challenged. Literature suggests that the implementation of LP positively affects organizational performance and corporate competitiveness (Huson & Nanda, 1994) (Oliver, Delbridge, & Lowe, 1996) (Bhasin, 2012). A positive answer provided to this question during the research would give further confirmation for the existence of the lean assumptions.

RQ3 aims to investigate the interrelationships between lean assumptions and company characteristics. It is well known that LP has a great effect on many aspects of the company. LP companies are often different from non-LP ones in many ways. They have different organizational structure (Womack & Jones, 1996), the regulation of their processes are stronger, (Jones, Womack, & Roos, 1990), they maintain stronger supplier partnership (Anand & Kodali, 2010), their workers are more empowered (Shah & Ward, 2007), their production strategy is more integrated (Vinodh & Chintha, 2011) and so on. To sum up, literature suggests that LP practitioner companies have some distinctive characteristics; therefore companies characterized by strong presence of lean assumptions should carry the same marks. If such correlations found would give other confirmation to the lean culture model.

However, the same differences, examined by RQ4, are not necessarily present in terms of organizational culture. As Cameron and Quinn (2011, p. 84) writes, “Our own and other’s research has found that congruent cultures, although not prerequisite for success, are more typical for high-performing organizations than incongruent cultures are”. In other words, the most significant feature of the organizational culture of successful companies is that they don’t have any outstanding feature; they are balanced and shared by everyone within the organization. Therefore, the correlation between LP and organizational culture deserves examination.

The hypotheses

Based on the research questions, the following hypotheses were created:

H1:

*Lean can be interpreted as an organizational culture and so,
a, can be interpreted at all abstraction levels of organizational culture
b, and the content and meaning of each level can be clearly defined.*

H2:

*Lean culture’s Basic Underlying Assumptions significantly determine
Corporate competitiveness.*

H3:

*Lean culture’s Basic Underlying Assumptions are significantly related to
organizational characteristics.*

Analysing hypotheses, it is clear that H1 was partially proven during the elaboration of the lean culture model. However, the content and structure of the lean assumptions still have to be confirmed. H2 is the presumed answer for RQ2 and was formulated in a way that it would align with information found in the literature. H3 was elaborated as a presumed answer for RQ3 and RQ4. These aimed to investigate in relation to lean culture the operational and organizational cultural characteristics of companies, however, in order to get a clear and simple hypothesis, these latter two expressions were left out, and only the phrase organizational characteristics were used. Nevertheless, during planning the research model, careful attention must be paid on assessing both operational and organizational cultural aspects.

The research model

To test the hypotheses, the research model was elaborated (Figure 3).

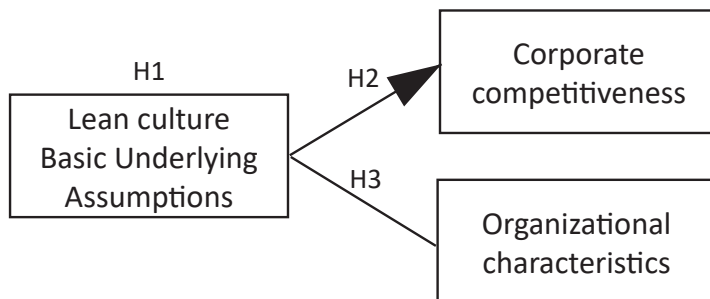


Figure 3 The model and hypotheses for the empirical research
Source: self edited

The model expresses the relationship that lean assumptions as independent variables significantly determine corporate competitiveness as dependent variable as indicated by the arrow. The compliance of this relationship is supported by researchers finding positive correlation between the implementation of LP practices and corporate operational success (Huson & Nanda, 1994) (Oliver, Delbridge, & Lowe, 1996) (Bhasin, 2012). Also, the model expresses the relationship between lean culture and organizational characteristics. At this case, only a line, not an arrow has been drawn in the figure, because the direction of the effects between the variables can't be decided.

Operationalization of items

To test hypotheses; an empirical quantitative research has been designed using a standardized questionnaire.

To survey lean assumptions, altogether 15 questions have been created, three for each assumption. The contents of the questions were defined based on the lean literature review.

To survey corporate competitiveness, a validated corporate competitiveness survey has been used (Chikán, 2006). This consists of 24 questions measured on a Likert scale ranging from one to five. The questions gather information from three components of corporate competitiveness (C): organizational ability to change (A), organizational operability (O) and organizational performance (P). The interrelations between these four items (C, A, O, P) serve as the basis of the competitiveness calculation method. The three items measured (A, O, P) determine corporate competitiveness (C), but also, there is a connection between them. Organizational ability to change (A) and organizational operability (O) determines the skills (S) of the company, which defines the organizational performance (P) as shown in the corporate competitiveness model (Figure 4). As a result, the corporate competitiveness is calculated through the following formula: $C = P * (O + A)$. (Chikán, 2006)

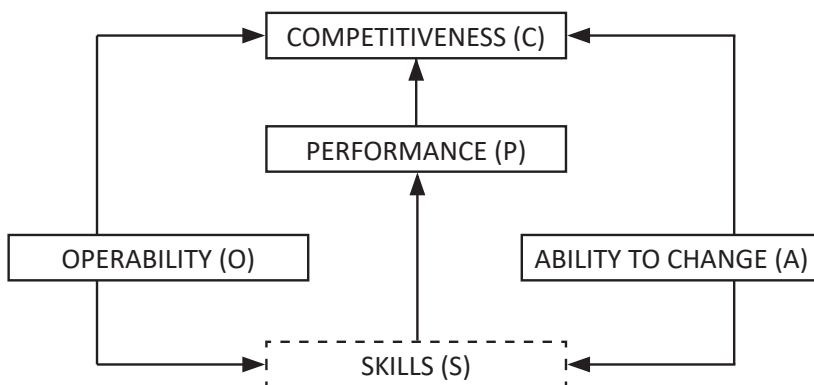


Figure 4 The corporate competitiveness model used for the research
Source: Chikán, 2006

McKinsey's 7S model (Figure 5) has served as a basis for measuring organizational characteristics. This model was chosen because it is a widely accepted model enumerating the factors (Strategy, Structure, Systems, Skills, Style, Staff and Shared values) that decisively influence organizational competitiveness (Deal & Kennedy, 1982). Also, as it was previously discussed at the analysis of the research questions, that during the research, both operational and organizational cultural characteristics of the companies have to be examined. The 7S model is ideal to meet these requirements, as the hard (Strategy, Structure, Systems) and three soft (Skills, Style, Staff) elements of the model can be interpreted as operational characteristics and the last soft element (Shared values) can be interpreted as organizational culture. (McKinsey, 2008)

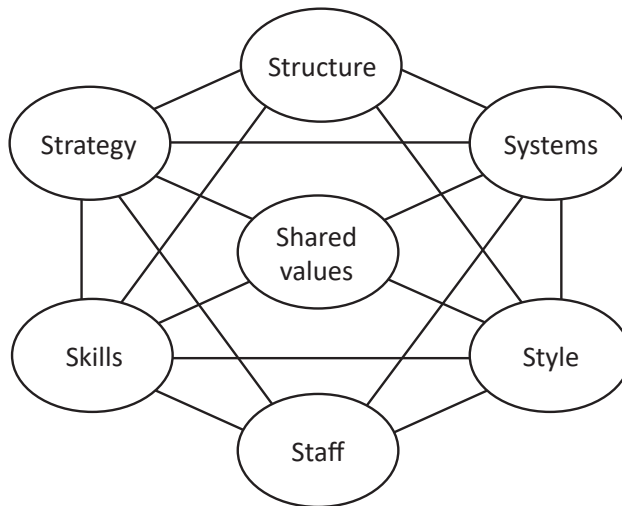


Figure 5 The McKinsey 7S model
Source: McKinsey, 2008

For five of six operational characteristic elements of the 7S model (Strategy, Structure, Systems, Skills, Staff), 18 own research questions were formulated. For the last operational characteristic element (Style), the Blake-Mouton leadership style assessment tool was used (Blake & Mouton, 1964), because it is a validated, widely accepted and easy to use method. For the organizational culture element (Shared values), Cameron and Quinn's Organizational Culture Assessment Instrument was used (Cameron & Quinn, 1999, p. 26–28). The reason for this choice is that this

assessment instrument is a validated, widely used and accepted and easy to use tool for gathering information about organizational culture.

Besides that, seven questions about basic company information like specific industry type, organizational hierarchy and years spent implementing LP have been worked out.

Methodology of the research

The scope of the research has been limited to Hungarian companies due to accessibility and linguistic reasons. Processing industry companies have been selected knowing that LP was originally a method for efficient production (Jones, Womack, & Roos, 1990), and also because of accessibility reasons. Among these, ones with 100 or more employees have been selected into the final research population which would improve interpretation of results. Also, no criteria have been specified for engagement in LP implementation, because comparing the results of LP implementers and non-LP implementers seemed to be reasonable. From these companies, production managers and continuous improvement managers were asked to participate as they were considered to be the ones to give the most appropriate answers.

The data was collected between April 2014 and December 2015. For this, several data collection methods were used. The questionnaire was sent to 959 companies via postal mail, to over seven thousand email addresses, and four hundred people were asked to provide data at different events.

Results

Responder statistics

During the data collecting period, total 254 valid questionnaires have been received from 192 companies, which is roughly 15 per cent of the total population (Table 1). From these, 151 companies had experience with implementing LP, while 41 haven't started this process yet. This ratio of lean implementer and non-implementer companies most likely does not reflect the real situation in the population as this value is biased by data collection methods. The 151 implementer companies have on average 5,32 years of experience with LP.

Company size [employees]	Research sample statistics		Population statistics		
	Number of responders	Responder ratio by company size	Number of companies by company size	Responder ratio in company size groups	Responder ratio compared to total population
100-250	51	26%	757	6,74%	4,13%
251-500	61	32%	262	23,28%	4,94%
501-1000	51	26%	128	39,84%	4,13%
1001-2000	22	11%			1,78%
More than 2001	8	4%	88	34,09%	0,65%
Σ	193	100%	1235	100%	15,63%

Table 1: response statistics,
Source: self edited

Testing Hypothesis 1

To test Hypothesis 1, on the answer scores given for lean assumption items, first Cronbach's Alpha calculation has been made to validate data consistency. If Alpha shows that the data is consistent it means that the items refer to the same entity, in our case lean culture. Performing the analysis, a value of 0,816 was calculated for Alpha that confirms the internal consistency of the data (Lance , Butts, & Michels, 2006).

In the next step, the structure of the data has been analysed. For this, exploratory factor analysis and confirmatory factor analysis have been performed. This method has been chosen as factor analysis is a tool that is capable to identify hidden, latent structure behind data (Székelyi & Barna, 2002). In our case, the factor analysis of data can confirm the structure of the five lean assumptions. However, statistical analysis did not confirm the original lean assumptions, but suggested a somewhat different structure (Figure 6).

Analysing the extracted factors from an interpretability point of view, they were found valid, and so a definition has been provided for each:

Factor 1 - Vision is improvement: The long term survival and prosperity of the company and its environment depends on employees and system constantly aiming to improve. Employees utilize their creativity and signal if they find an opportunity for improvement, but they do not make hasty decisions. They chose the right solution after a careful consideration of all possible options to make sure they prefer long term objectives at decision making, even against short term financial goals. All systems in the company are created in a way that they represent the need for improvement.

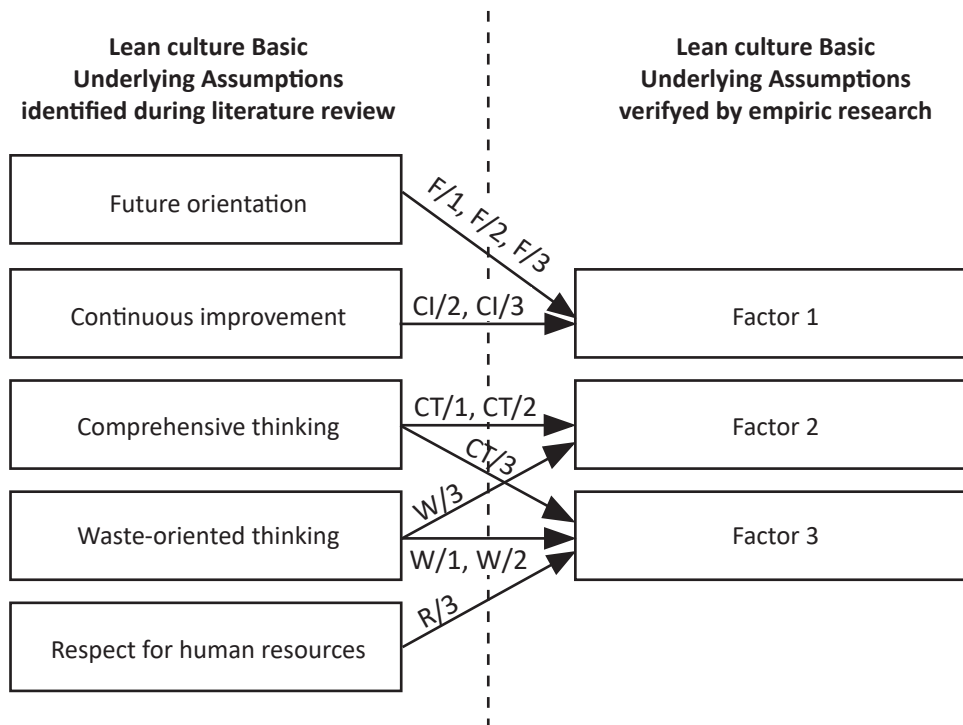


Figure 6 The formulation of new factors from originally defined lean assumption items. Items from Continuous improvement (CI/1) and Respect or Human resources (R/1, R/2) were omitted from the final model.

Source: self edited

- Factor 2 - System level rationalization: The employees recognize that every part of their company is interconnected to each other. Keeping this in mind they design and build all of their systems to work in harmony and synergy. To this end, they are striving to identify and eliminate irrationalities breaking this harmony.

- Factor 3 - Objective waste elimination: The employees of the company consciously search for and highlight wastes especially problems that make their work difficult or uncomfortable. The task of eliminating wastes is given to mixed and empowered teams and assisted through intensive and extensive communication. The waste elimination work is based on objectivity, breakdown of losses, measurements and detailed analysis.

As for the original lean assumptions, the opposite definition for all assumptions has been formulated.

- Fast decisions for improvement – greedy algorithm¹ (the opposite of Vision is improvement): The long term survival and prosperity of the company depends on the result-oriented attitude of the employees. Employees utilize their creativity to reach tangible results as quickly as possible; when a problem arises they make efforts to treat symptoms so that the problem would not risk their actual work. They prefer short term financial goals instead of long term possibilities. All systems in the company are created in a way that they represent the need for reaching result goals.
- Superposition principle (the opposite of System level rationalization): The employees of the company adopt the principle of superposition, that is to say, the excellent operation of the parts ensures the excellent performance of the whole. Sub-systems are designed and operated with the aim of maximizing their efficiency in their own sole, narrowly interpreted environment. In this belief, interconnections, synergies and communication between sub-systems are not considered important and will not receive any special attention.
- Task-force logic (the opposite of Objective waste elimination): The employees of the company are requested to concentrate on accomplishing their jobs. It is not a shared task to identify and solve wastes, this the responsibility of a specially trained team of professionals and managers. Improvement initiatives are derived from the corporate strategy and guided by a small group of specialists; utilization of the results is the duty of the workers in the area concerned.

¹ The greedy algorithm always selects the choice that is optimal at the given step, or in other words, delivers the greatest immediate results. It chooses the local optimum in the belief that this would lead to a globally optimal solution. (Cormen, Leiserson, & Rivest, 2003)

Testing Hypothesis 2

To test Hypothesis 2, a linear regression analysis has been made where the new lean assumptions served as the independent variable and components of corporate competitiveness (organizational ability to change, organizational operability and organizational performance) and corporate competitiveness itself as dependent variable (Table 2). The analyses of the results show that all lean assumptions have a significant positive effect on corporate competitiveness and its components.

	<i>R</i> ²		Coefficients		
	determination coefficient	Constant	Vision is improvement	System level rationalization	Objective waste elimination
Organizational ability to change	0,426	3,358	positive significant (+0,265)	positive significant (+0,074)	positive significant (+0,181)
Organizational operability	0,368	3,585	positive significant (+0,180)	positive significant (+0,076)	positive significant (+0,112)
Organizational performance	0,082	3,610			positive significant (+0,318)
Corporate competitiveness	0,229	25,446	positive significant (+2,129)		positive significant (+3,370)

Table 2: The result of the regression analysis testing Hypothesis 2
Source: self edited

Testing Hypothesis 3

To test Hypothesis 3, a correlation analysis has been made between the lean assumptions and the elements of the 7S model.

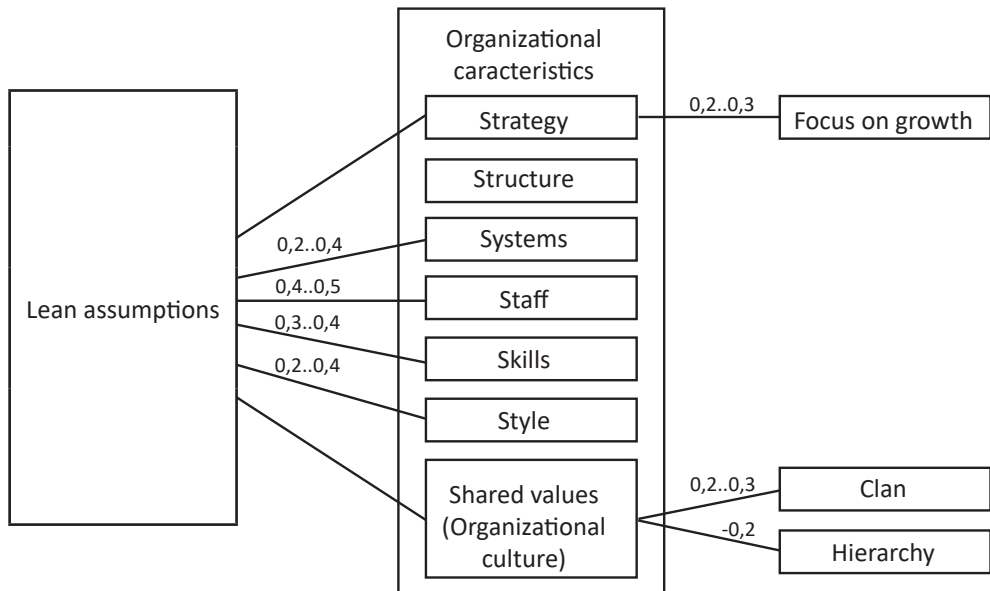


Figure 7 The correlation of lean assumptions and organizational characteristics
Source: self edited

Figure 7 summarizes the results of the correlation analysis made between lean assumption and organizational characteristic items. The result are visualized in a simplified way for two reasons. The analysis included examining correlations between more than fifty items; a detailed visualization of the results would be impractical. Also, during the analysis, it was observed that many items show similar behaviours when compared to lean assumptions. The analysis found relatively little correlation between hard elements of the 7S model, and relatively strong correlation between all the soft elements.

Implications

The research has revealed a lot of interesting aspects of interrelationship among LP, LP implementation and organizational culture. The results are useful are they are both creating new opportunities for researchers, and new LP implementation practices for practitioners.

Research findings

The primary finding of the research is that Lean can be interpreted as an organizational culture, because firstly, it could be interpreted at all abstraction levels of Schein' organizational culture model, and secondly, the content and meaning of each level could be clearly defined. For this, the unified lean culture model has been elaborated. The Tools, Methods and Espoused values levels of the model have been defined based on comprehensive literature analysis while the Basic Underlying Assumptions level of the model has been defined through an empirical research. By these, the research findings can be interpreted as a supplement and continuation of the works from Gelei et al. (2013), Toarniczky et al. (2012), Losonci et al. (2017) and Modig & Åhlström (2012).

The empirical research also pointed out that lean culture Basic Underlying Assumptions significantly and positively determines Organizational ability to change, Organizational operability, Organizational performance, and as a consequence, Corporate competitiveness. As the strength of lean culture characteristics was measured through the level of lean culture Basic Underlying Assumptions, the findings consequently imply that lean culture significantly and positively determines the same corporate competitiveness components. It has to be added that though placing their focus on technical maturity of LP instead of cultural maturity of LP, previously, many researchers have come to similar results regarding LP (Liker & Yen-Chu, 2000) (Rother & Shook, 2012).

The empirical research has shown that lean culture Basic Underlying Assumptions correlate significantly and positively with the Clan characteristics of the organizational culture, negatively with the Hierarchy characteristics of the organizational culture, positively with the growth focus of strategy, positively with the level of sophistication, development and transparency of processes, and positively with Staff, Style and Skills of soft elements of organizational characteristics. The findings related to Clan and Hierarch characteristics indirectly contradicts with the findings of Cameron and Quinn (2011, p. 84), who identified congruent cultures being more typical for high-performing companies than incongruent ones. The contradiction is indirect; because our research has found that strong presence of lean culture Basic Underlying Assumptions results in improved corporate competitiveness, and at the same time, it has also found correlation between the strong presence of lean culture Basic Underlying Assumptions and Clan, Hierarchy characteristics. Considering these relations transitive, it could be deduced that Clan and Hierarchy characteristics determine corporate competitiveness, but this conclusion is not supported by the data.

The contradiction is indirect; because our research has found that strong presence of lean culture Basic Underlying Assumptions results in improved corporate competitiveness, and at the same time, it has also found correlation between the strong presence of lean culture Basic Underlying Assumptions and Clan, Hierarchy characteristics. Considering these relations transitive, it could be deduced that Clan and Hierarchy characteristics determine corporate competitiveness, but this conclusion is not supported by the data. A correct conclusion could be that the strong presence of Clan, and the weak presence of Hierarchy characteristics are supportive towards strengthening lean culture Basic Underlying Assumptions, and so, LP implementation.

Further correlations between lean culture and organizational characteristics highlight that the bond between LP and the soft elements of organizational characteristics is much stronger and extensive than the bond between LP and the hard elements of organizational characteristics. Nonetheless, researches analysing the hard outcomes of LP are much more widespread (Pham & Thomas, 2012) (Hines, Holweg, & Rich, 2004) than ones analysing the soft outcomes of LP (Jones, Womack, & Roos, 1990) (Shah & Ward, 2003).

To sum up, the data gathered during the research confirm the Hypotheses.

Lean interpreted as culture

The research provides further evidence for the notion that LP implementation should be interpreted as an organizational cultural change. Results highlight, that it is not enough and rather misleading to put focus on LP tools only during the implementation process. As Takeuchi, Osono, & Shimizu (2008, p 12.) stated, “Emulating Toyota isn’t about copying any one practice; it’s about creating a culture.” Also, results give practical implications about aspects of organizational culture that should be changed implementing LP. Espoused values and Basic Underlying assumptions are defined by the unified lean culture model which companies should aim to reinforce for becoming leaner.

Interpreting lean as culture has important consequences. It explains from a relatively new aspect why overwhelmingly technical focus of typical lean implementations (Péczely, 2017) most often does not lead to optimal results. A relatively new aspect, because despite it was proven that cultural issues are responsible for lean implementation difficulties (Friel, 2005) (Benders & Slomp, 2009) (Jenei, 2010), these researches treated this symptom in a one-sided manner.

They suggested that the organizational culture of the implementing company is responsible for the events. However, this research points out the importance of the basic concept of the lean implementation process. It shows that at those cases where organizational culture was blamed for implementation difficulties, rather the implementation process was faulty. The implementers expected their company's culture to be open for a technical focused lean implementation instead of transforming the implementation to a socio-technical process that helps to overcome cultural gaps. In other words, the research highlights that lean implementations have to be able to form the company's culture in a way that it would become supportive towards the technical elements of lean. For this, the current state and the required state of the organization's culture have to be measured and defined and the change between the two states managed.

From another point of view, by validating the lean culture model, the research explains why it is so difficult to sustain lean implementation results and why improved company operations tend to return to their pre-implementation state. (Browaeys & Fisser, 2012) (Bhasin, 2012) (Lund, 2014) (Brodzinski, 2015) As the model indicates, each element of it is connected to each other and consequently they affect each other. If an element of the lean culture is changed, it would slowly start changes in the other elements. However, this relation is transitive, which means that the effects are back and forth. The changed element affects the unchanged one and the unchanged one affects the changed one. This is the process Schein (2004) has described about how Basic Underlying Assumptions effect Espoused values and Artefacts and vice versa. The result of this kind of relationship is that, if during the lean implementation, only tools and methods are changed in a short period of time (as often done in technical focused implementations) the espoused values and assumptions would only barely change. And so, they would put constant pressure on the tools and methods to change back to the pre-lean state. At the moment the special attention and pressure to sustain is reduced, lean tools and methods would be changed back to their original state due to the changing effect of the other levels of culture. This provides further lessons for lean implementers. They can choose between two ways. They either can decide to change tools and methods and to sustain results they accept that they have to invest great efforts for a long time. Or they can decide to change all levels of culture towards the lean direction, which is a great investment at the beginning, but it would guarantee effortless long term sustainability.

At this point a remark is required. During the previous sections, the technical focused lean implementations are often criticised, but it has to be made clear that companies should not be blamed for choosing this approach. Their aim is to improve their production, a technical process that results in the fabrication of a tangible product and LP includes plenty of technical tools and methods that aid this initiative. Therefore it is an absolutely logical choice to concentrate on the technical elements, but as shown before, also misleading.

The relationships between lean culture and organizational characteristics

The notion that lean implementation is a change of organizational culture is quite often cited (Browaeyns & Fisser, 2012) (Mann, 2005 (Radnor, Walley, Stephens, & Bucci, 2006), but rarely backed with concrete, executable practical suggestions. This research, by identifying lean assumptions and crafting a tool to measure the level of lean assumptions give a practical method that implementers could use to increase the success rate of their lean implementation process. Assessing the level of lean assumptions at a company could give a good guideline on how much the organizational culture should be changed. Is it nearly at the point that is supportive towards LP, or rather a lot of attention is required to come to the desired state? Which aspects of lean assumptions are strong at different organization units and management levels, which characteristics, behavioural patterns needed to be strengthened? If the answers for these questions are clear, companies can easily and purposely choose from well-known development tools (e.g. teambuilding, communication trainings, root-cause analysis training) and thus, make the whole lean implementation process more controlled and guided.

The research also gives hints about which other organizational characteristics and how should be reconsidered during the lean implementation. Mainstream LP literature puts more emphasis on the technical elements of LP (Shingo, 1999) (Ohno, 1988) (Womack & Jones, 1996), however this research has proved that the presence of lean assumptions are at least as much related to soft characteristics of the companies as hard, technical ones. Thus, if soft characteristics remain unchanged and only technical characteristics are improved during the lean implementation, the likelihood of lean assumption characteristics resisting change increases. Also, the research provides guidelines how the soft elements of the company should be changed to become more supportive towards LP. Propagating Clan features and team management style, developing skills and staff would all be beneficial.

The research also provides an easy to use tool for measuring the presence of lean assumptions in organizational culture. Using the questionnaire, managers can get a detailed feedback about their company's current situation before implementing LP at the same time opening the possibility for monitoring the progress (for example by yearly repeated surveys).

Summary

In the paper, the possibilities for interpreting LP as a type of organizational culture were examined. It has been shown that this topic deserves special attention because researchers quite often identify organizational cultural factors responsible for LP implementation failures. Despite the importance of the topic, surprisingly few attempts aiming to define lean culture were found, from which none could offer a complete, validated definition suitable for surveying.

Learning from the experiences of these researchers, a unified lean culture model has been elaborated. The elements of the unified lean culture model were derived from the organizational culture model of Schein (2004) and the structure of the unified lean culture model was derived from the model of Modig & Åhlström (2012). Building from bottom to top, the elements of the model are Basic Underlying Assumptions, Espoused values, Methods and Tools. The elements are connected to each other in way that Basic Underlying Assumptions determine Espoused Values, which determine Methods, which determine Tools. From the other side, successful changes in Tools can modify Methods, which if successful, can modify Espoused Values, which if successful, can modify Basic Underlying Assumptions.

To validate the unified lean culture model, a quantitative research has been worked out including a surveying questionnaire measuring lean culture Basic Underlying Assumptions, corporate competitiveness and organizational characteristics. Hungarian processing industry companies have been invited to participate in the research. The results have confirmed the Basic Underlying Assumptions element of the unified lean culture model with small changes compared to the original version. The final Basic Underlying Assumptions have been named: Vision is improvement, System level rationalization and Objective waste elimination. Analysing these, valid counterparts for each Basic Underlying Assumption have been found, and named respectively: Fast decisions for improvement – greedy algorithm, Superposition principle and Task-force logic. These highlight that implementing LP and propagating lean culture is not a self-evident choice, but a decision between viable alternatives.

The research has also provided evidence that the lean culture characteristics of a company correlate with its competitiveness. From on hand, these findings add a further confirmation to the researches appreciating the outstanding results that could be gained by implementing LP. From the other hand, it highlights that implementing LP bearing the aspects of lean culture and lean culture Basic Underlying Assumptions in mind, compared to traditional implementation processes, improved results could be gained.

Finally, the research has shown that relationships among organizational characteristics and lean culture are stronger in terms of soft characteristics than in hard ones. These findings underline the recently more and more voiced opinion of many researchers that implementing LP is much more than implementing technical tools, also, it is a change in organizational behaviour and by this, in organizational culture.

Applying results, companies can greatly improve the efficiency of their LP implementation and through this; they can significantly improve their competitiveness.

References

- Anand, G., & Kodali, R. (2010): Analysis of Lean Manufacturing Frameworks. *Journal of Advanced Manufacturing Systems*, 1–30.
- Báthory, Z. (2011): *A lean és a vezetési stílus összefüggései*. Vállalatgazdaságtan Intézet, Budapest: Budapesti Corvinus Egyetem.
- Benders, J., & Slomp, J. (2009): Struggling with solutions; a case study of using organisation concepts. *International Journal of Production Research*, 5237–5243.
- Bhasin, S. (2012), Prominent obstacles to lean. *International Journal of Productivity and Performance Management*, 403–425.
- Blake, R., & Mouton, J. (1964): *The Managerial Grid*. Houston: Gulf Publishing Company.
- Brodzinski, P. (2015, 06 01): *Why We Fail to Change: Understanding Practices, Principles, and Values Is a Solution*. Retrieved 05 January 2017, from <https://www.infoq.com/articles/change-practices-principles-values>
- Browaews, M. J., & Fisser, S. (2012): Lean and agile: an epistemological reflection. *The Learning Organization*, 207–218.
- Cameron, K. S., & Quinn, R. E. (2011): *Diagnosing and Changing Organizational Culture: Based on the Competing Values Framework* (3. ed.). San Francisco: Jossey-Bass.

Cameron, K., & Quinn, R. (1999): *Diagnosing and Changing Organizational Culture*.

Chikán, A. (2006), A vállalati versenyképesség mérése. *Pénzügyi Szemle*, 42–56.

Cormen, T. H., Leiserson, R. L., & Rivest, R. L. (2003): *Algoritmusok*. Budapest: Műszaki Könyvkiadó.

Deal, T. E., & Kennedy, A. A. (1982): *Corporate Cultures, The Rites and Rituals of Corporate Life*. Reading: Addison-Wesley Publishing Company.

Demeter, K., & Losonci, D. (2011): Lean termelés és üzleti teljesítmény – nemzetközi empirikus eredmények. *Vezetéstudomány*, 14–27.

Dennis, P. (2002): *Lean Production Simplified*. New York: Productivity Press.

Friel, D. (2005): Transferring a lean production concept from Germany to the United States: The impact of labor laws and training systems. *Academy of Management Executive*, Academy of Management Executive.

Gelei, A., Losonci, D., Toarniczky, A., & Báthory, Z. (2013): A LEAN MENEDZSMENT ÉS A LEADERSHIP JELLEMZŐK KAPCSOLATA A HAZAI VÁLLALATI GYAKORLATBAN. *VEZETÉSTUDOMÁNY*, 1–17.

Hines, P., Holweg, M., & Rich, N. (2004): Learning to evolve - A review of contemporary lean thinking. *International Journal of Operations & Production Management*, 994–1011.

Holweg, M. (2006): The genealogy of lean production. *Journal of Operations Management*, 420–437.

Huson, M., & Nanda, D. (1994): The impact of Just-In-Time manufacturing on firm performance in the US. *Journal of Operations Management*, 297–310.

Imre, N., Jenei, I., & Losonci, D. (2007): What is lean culture – and how to measure it? *University of Cambridge, Operations in the public sector PUB4*, pp. 1–10. Cambridge.

Jenei, I. (2010): A karcsú (lean) elvek alkalmazásának tapasztalatai az egészségügyi folyamatok fejlesztésében. *Vezetéstudomány*, 18–37.

Jones, D., Womack, P., & Roos, D. (1990): *The Machine that Changed the World*. New York: Free Press.

Krafcik, J. (1986): *Learning from NUMMI. IMVP Working Paper*. Cambridge, MA.: Massachusetts Institute of Technology.

Lance, C. E., Butts, M., & Michels, L. C. (2006): The Sources of Four Commonly Reported Cutoff Criteria: What Did They Really Say? *Organizational Research Methods*, 202–220.

Liker, J., & Yen-Chu, W. (2000): Japanese Automakers, U.S. Suppliers and Supply-Chain Superiority. *Sloan Management Review*, 81–93.

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*, 1–24.

Lund, B. (2014, 08 24): *TWI Service Blog*. Retrieved 10 January 2017, from Lean Failure Rates.

Mann, D. (2005): *Creating a lean culture: tools to sustain lean conversion*. New York: Productivity Press.

McKinsey. (2008): Enduring Ideas the 7S Framework.

Miller, D. (2005): *Going Lean in Health Care, Institute for Healthcare Improvement (IHI)*. Retrieved 13 January 2017, from <http://www.ihl.org/IHI/Results/WhitePapers/GoingLeaninHealthCare.htm>

Modig, N., & Åhlström, P. (2012): *This is Lean*. Stockholm: Rheologica Publishing.

Naruso, T. (1991): Taylorism and Fordism in Japan. *International Journal of Political Economy*.

Ohno, T. (1988): *The Toyota Production System: Beyond Large-Scale Production*. New York: Productivity Press.

Oliver, N., Delbridge, R., & Lowe, J. (1996): Lean Production Practices: International Comparisons in the Auto Components Industry. *British Journal of Management*, 29–44.

Péczeley, G. (2017): *A Lean alternatív értelmezésének értékelése a hazai feldolgozóipari vállalatok körében*.

Pham, D., & Thomas, A. (2012): Fit manufacturing: a framework for sustainability. *Journal of Manufacturing Technology Management*, 103–123.

Radnor, Z., Walley, P., Stephens, A., & Bucci, G. (2006): Evaluation of the Lean Approach to Business Management and Its Use in the Public Sector. *Scottish Executive Social Research*.

Rother, M., & Shook, J. (2012): *Tanulj meg látni. Az értékfolyamat-térképezés szerepe az értékteremtésben és a veszteség kiküszöbölésében*. Budapest: LEI Magyarországi Egyesülete.

Sackmann, S. A. (1991): *Cultural Knowledge in Organizations, Exploring the Collective Mind*. London: SAGE Publications.

Schein, E. (2004): *Organizational Culture and Leadership*. San Francisco: Jossey-Bass.

Shah, R., & Ward, P. (2003): Lean manufacturing: context, practice bundles, and performance. *Journal of Operations Management*, 129–149.

Shah, R., & Ward, P. (2007): Defining and developing measures of lean production. *Journal of Operations Management*, 403–419.

Shingo, S. (1999): *A Study of the Toyota Production System an Industrial Engineering Viewpoint*. CRC Press.

Székelyi, M., & Barna, I. (2002): *Túlélőkészlet az SPSS-hez*. Budapest: Typotex Elektronikus Kiadó Kft.

Takeuchi, H., Osono, E., & Shimizu, N. (2008, 06): *The Contradictions That Drive Toyota's Success*. Retrieved 03 July 2017, from Harvard Business Review: <https://hbr.org/2008/06/the-contradictions-that-drive-toyotas-success>

Toarniczky, A., Imre, N., Jenei, I., Losonci, D., & Primecz, H. (2012): A Lean Kultúra Értelmezése és Mérése egy Egészségügyi Szolgáltatónál. *Vezetéstudomány*, 106–120.

Vinodh, S., & Chintha, S. (2011): Application of fuzzy QFD for enabling leanness in a manufacturing organisation. *International Journal of Production Research*, 1627–1644.

Womack, J., & Jones, D. (1996): *Lean Thinking*. New York: Free Press.



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