Success Factors and Limitations Concerning LEAN Management in Austrian Companies

Urban, Melinda
UAS Joanneum, International Industrial Management, Austria
Irsa, Wolfram
UAS Joanneum, International Industrial Management, Austria

Abstract

The paper describes the research work about limitations, complications, weaknesses, and success factors that can occur through applying LEAN – a quality management system - in Austrian companies. Applying a quantitative research approach, a detailed questionnaire about the innovation status of the subject matter was sent to 1367 companies. Two hundred twenty-two thoroughly answered questionnaires provided sufficient feedback to demonstrate the statistical significance of the results. The statistical description of the findings unveils the following elements: (1) LEAN methods, (2) LEAN principles, (3) LEAN thinking, together with (4) smart integration of Industry 4.0/5.0 enables enormous advantages in the pursuit of success of any corporation in the survey. However, the complexity of business processes, the limitations in strategic scope, and the weak implementation of LEAN systems hinder companies from unfolding the full potential of LEAN management. Primarily, over-optimized utilisation of the concept and the persistent resistance of employees against any change are explained in detail and enriched with anecdotal descriptions. The research results are explained with bar charts and tables to provide a clear and coherent presentation: LEAN processes are the prerequisites for any sustainable digitalisation efforts in the future.

Keywords: Digitalization; LEAN Management; Quantitative Research; Technological Transformation
JEL classification: D91, L60, O31

Paper type: Research article
Received: 21 January 2023
Accepted: 21 March 2023

DOI: 10.54820/entrenova-2023-0011

Introduction

The term 'LEAN management' or 'LEAN production' appears in management theory and practice in the late 1980s and early 1990s. The principle behind these terms has been known in Asia since the 1950s. The Japanese car manufacturer Toyota developed, for the reasons of the post-war period, a flexible production system, which made fast set-up processes possible. The reduction in set-up time brought other positive effects, such as a reduction in lead time, production diversity in small batch sizes, and a reduction in costs. As a result, Toyota was able to generate enormous success with the help of what was then called the Toyota Production System. (Drew et al., 2005; Growth and Kammel, 1994, p. 23.)

The publication of a research paper about a five-year study of the subject matter by the Massachusetts Institute of Technology enabled this topic to be widely and rapidly disseminated among experts. The realisation that LEAN management or LEAN production not only has to be applied in automotive manufacturing but can also be used across all industries was gaining momentum. For this reason, various companies in the 1980s focused on this principle. However, outstanding successes such as those seen at Toyota failed to materialise. While rapidly spreading the term LEAN itself, the clarity and problem understanding of LEAN management could not keep pace, which is why companies tried to achieve the goal of LEAN through ill-considered optimisation attempts, such as personnel layoffs and across-the-board cost cuts (Growth & Kammel, 1994; Lichte, 2016).

Over time, LEAN management gained more concreteness, and the initial complications and misconceptions were resolved by the explicit explanation and meaning of the term and the principle. The main goal of LEAN management is to avoid unnecessary costs, increase profitability, improve competitiveness, meet customer needs, minimise waste, and deliver the best product quality (Best & Hurtz, 2018; Lichte, 2016). Other goals include:

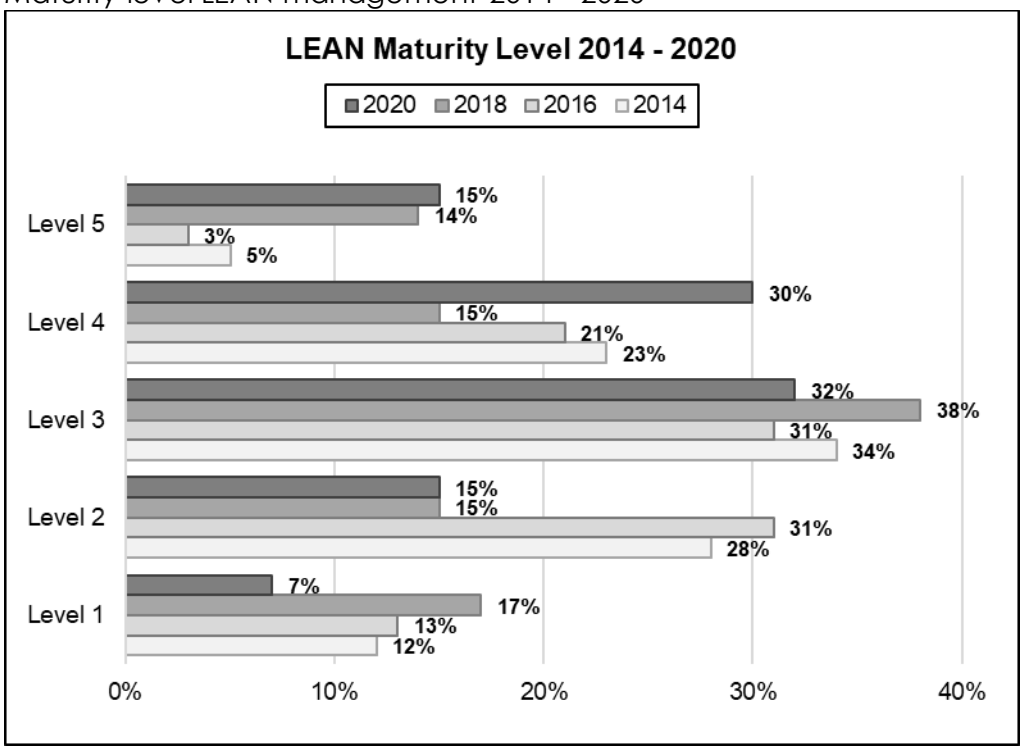
- The strict focus on customer satisfaction, market proximity and time requirements,
- the consistency of core functions with a strong focus on the value chain
- the improvement of quality, productivity, and processes, as well as
- the best possible use of human capital and the development of a qualitatively and quantitatively optimised product range with the smallest possible factor cost input.

Merely striving for the goals is not sufficient for the efficient application of LEAN management. To enjoy sustainable success, anchoring in the corporate culture and thus increasing the level of maturity of LEAN management are essential factors. LEAN Change management (LCM) is suitable as a basis for successful cultural transformation. LCM is a new method of change management that is based on feedback for change. With this LEAN and agile method, insights from employees, managers, the market, etc., are collected and summarised as hypotheses and assumptions, and experiments are built to test them. The results of the testing are measured and subsequently evaluated and adjusted. The application of LCM creates several advantages in the change management effort:

- New and innovative thinking
- Emotions and needs of the employees are at the centre
- Experiments are conducted, and priorities are adjusted
- Employees can help shape the change process
- Transparency and measurability
- Risk and waste are minimised
- Focus is on added value for employees and customers

LCM can mitigate or even avoid employee resistance without endangering the change process, which also increases the maturity of LEAN management (Mahleb, 2021). The following figure shows the development of the LEAN maturity level in companies over time.

Figure 1
Maturity level LEAN management 2014 - 2020



Source: Author's illustration according to Kudernatsch (2021)

Figure 1 presents the findings over time of 320 participants (on average) about their LEAN management maturity level. With a self-assessment approach, they answered 15 questions using a Likert scale with five levels, from 'maturity level very low' (level one) to 'maturity level very high' (level five). The results show that, in 2020, 30% of companies justify embedding LEAN management in their corporate culture at level four, with an increase evident from 2014 to 2018. Level one shows the biggest leap in the right direction, with a 10% decrease in maturity compared to 2018 and 2020.

The research works on hand builds on this observation from Kudernatsch (2021) and links it to current digitalisation efforts in the industry, called Industry 4.0 (I4.0) and Industry 5.0 (I5.0). I4.0 means the digitalisation effort to integrate business processes using Big Data, Cloud technology, Cobots, Internet-of-Things, and Simulation. I5.0 refers to artificial intelligence using the infrastructure provided by I4.0 (e.g., autonomous vehicle systems). The research-guiding research question is as follows: What are the limitations and success factors of LEAN management in the context of digital transformation?

Method

The chosen research design is quantitative data collection through a questionnaire with the subsequent statistical description. In order to obtain significant results, it is necessary to contact a large number of potential participants. The quality of the

results is equally relevant. High-quality results can be achieved by asking relevant questions, from which a high degree of expressiveness regarding the research topic can be obtained. In addition, it would be advantageous if the participants had a broad knowledge of the research topic of LEAN management. In this section, the type of data collection, the selection of participants, the structure and the evaluation of the questionnaire are explained.

A questionnaire is a standardised set of questions that various target persons or groups answer to evaluate the responses. Through the evaluation, an underlying theoretical concept is supposed to show connections between the answers, thus representing a connection between theory and analysis. In a questionnaire, a theoretically justified and systematically presented selection of questions are asked, which are based on a theoretically defined knowledge interest. This knowledge interest is empirically verified based on the obtained data. When creating a questionnaire, not only must the correspondence between the content of the questions and the goal of data collection be considered, but also the correspondence between the selected types of questions and the goal of the research must be of importance. For the requirements of a questionnaire to be translated into reality, an intensive and detailed examination of it is necessary. With the content of the questions, the kind of questions, and above all, the goal in mind to answer the research question, the following is necessary (Porst, 2015).

Data collection with a questionnaire

An online survey tool was chosen to create the questionnaire and different types of questions, such as open questions, single-answer, multiple-answer, and dropdown questions. A Likert scale was used for the questionnaire.

- **Single answer:** Choose one answer option out of many predefined answer options.
- **Multiple answers:** Choose one or more answer options from many given answer options.
- **Open question:** The participant answers in their own words to answer the question asked.
- **Dropdown question**: Choose one of the answer options from a list (dropdown) of different options.
- **Likert scale:** A scale is used to measure attitudes, opinions, etc., often using four to seven scale points (Porst, 2015).

Survey participants

For a quantitative survey to be significant, many participants must answer the questionnaire. Potential participants of the survey are LEAN managers in all Austrian companies, as well as department heads, company managers, quality managers, process managers, and other persons who know about the status of LEAN management in the company and can evaluate it.

To reach as many people as possible, different ways of contacting them were used:

1) personal contacts
2) e-mail addresses (including office addresses) of Austrian companies using the website of the Federation of Austrian Industries
3) study programs of the FH Johanneum Kapfenberg
4) The social media platforms LinkedIn and Xing were used. LinkedIn proved to be especially helpful, as this platform allows one to search for activities, which is why mainly LEAN managers could be contacted directly.

With these four different ways of identifying contacts, a total of 1001 individuals and 366 companies (office addresses) could be approached. In addition to selecting and searching for survey participants and choosing the appropriate types of questions, a clear and theoretical structure of the online survey is a relevant factor.

Structure of the questionnaire

The online survey to obtain knowledge on this research topic was divided into four categories. Category 1 contains general questions about the company in which the participant of the questionnaire is employed. The results from category two are intended to provide general data on LEAN management. Category 3 asks specific, more detailed questions about LEAN management in the company and finally, category 4 explains the limitations of LEAN management in the companies concerned. For this paper, only the answers out of Category One and parts of Category Four are consulted.

In addition to Category 1, in which questions are asked about the size of the company, the number of employees, the function of the participants and the application of LEAN management in the company, in Category 4, there are questions about implementation weaknesses, over-optimized application of the concept and resistance of employees. By answering the individual questions, it becomes clear whether LEAN management fails due to a lack of implementation, whether the system is applied too intensively, or whether the lack of acceptance by the employees prevents sustainable and successful LEAN management in the company. Together with the questions from category four, an explanatory model is developed to answer the research question from different perspectives.

Evaluation of the data

From all received answers to the questionnaire, only completely answered questionnaires are included for the evaluation since only these are relevant for answering the research topic. In total, 364 participants took part in the online survey. Of these, 222 surveys were answered completely, which were considered for evaluation. One hundred forty-two questionnaires were not filled out incompletely.

Results

This section provides an analysis and descriptive explanation of the data obtained from the questionnaires regarding implementation weaknesses, over-optimized applications, and employee resistance. The questionnaire was sent out to 1367 contacts, of which 222 fully answered questionnaires were returned, resulting in significant data collection.

Information about the participating companies

The participating companies come from a wide range of industries, such as machinery and metal goods, automotive, mining and steel, electronics, paper processing, food, wood, glass, and construction. They are also of different sizes, mostly with more than 3000 employees but also with less than ten employees. Of the people who filled out the questionnaire, nearly 45% were LEAN managers in the company. The other participants are active in other management and leadership positions.

The evaluation's results are of high quality, as many of the participants have a broad knowledge of the situation in the LEAN area of the company. About a quarter of the participating companies have already implemented LEAN management for between seven and eleven years, and around a quarter of the companies even longer. Just

under 80% of the companies state that they have a person responsible for LEAN management.

Limitations, characteristics, and success factors

This section finds answers to the limitations, characteristics, and success factors of LEAN management by evaluating the questions on implementation weaknesses, over-optimized applications, and employee resistance.

Implementation Weakness

A Likert scale was created to evaluate the statements and answer questions about the implementation weaknesses of LEAN management. Table 1 below shows the results.

Table 1

Evaluation of implementation weakness

Implementation Weakness Preferred answer: I fully agree	Do not agree at all	Somewhat agree	Tend to agree	Fully agree
Not only LEAN methods are followed in the company, but also the LEAN principles	4,5%	22,5%	**45,9%**	27,0%
LEAN managers are aware of the results that have to be achieved with LEAN management.	2,3%	14,0%	41,0%	**42,8%**
No employees were laid off or hierarchy levels eliminated as a result of LEAN management	8,1%	13,5%	27,0%	**51,4%**
LEAN methods are used not only in production (main activity) but also in administrative areas of the company	12,6%	**33,3%**	28,4%	25,7%
LEAN managers have a broad knowledge of LEAN management and are passionate about the subject.	2,7%	16,7%	**41,4%**	39,2%
LEAN leaders exemplify LEAN management and would describe themselves as 'LEAN leaders.'	4,1%	21,6%	**44,6%**	29,7%
LEAN managers regularly visit the employees' workplaces to discuss processes and possible problems.	7,2%	26,1%	**38,3%**	28,4%
The motivation of the employees regarding the pursuit of LEAN management is always present.	5,9%	**44,6%**	44,1%	**5,4%**
Suggestions for improvement from employees are listened to by LEAN managers and implemented in a timely manner.	4,1%	22,1%	**53,6%**	20,3%
Any defects that occur in the product during the production	5,4%	20,7%	**41,9%**	32,0%

process are always analysed in order to get to the root cause.				
LEAN management is pursued in the company through management teams and teamwork among employees	6,8%	22,1%	**43,2%**	27,9%
LEAN management is a habit in the company and has been anchored in the corporate culture	14,4%	29,3%	**38,7%**	17,6%
The complete introduction and implementation of LEAN management took several months to several years.	2,3%	7,7%	22,1%	**68,0%**
The entire company hierarchy follows the LEAN philosophy, the trading and thinking of LEAN management	14,9%	34,2%	**38,3%**	12,6%

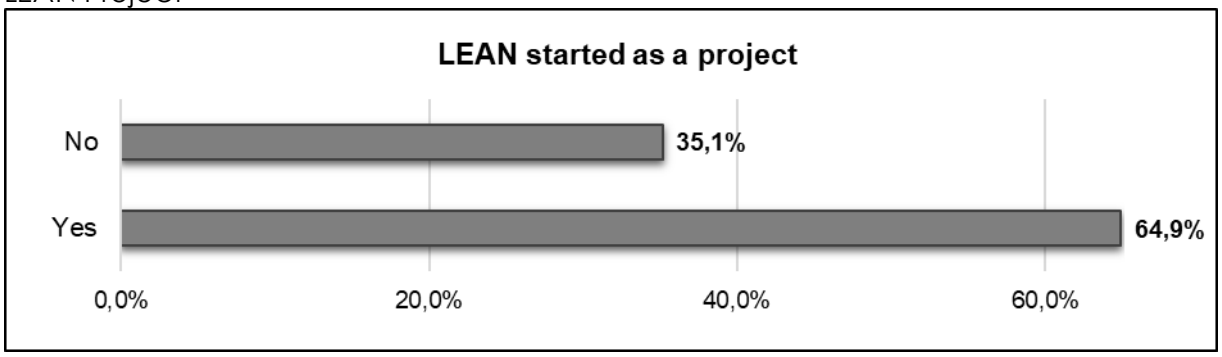
Source: Authors' Illustration

The highest frequencies are highlighted in bold in the table, which shows that only three statements have the preferred answer. It is evident that LEAN management is mainly pursued in production or the main activity of the company and is not applied in the administrative areas. Secondly, there is a lack of motivation among the employees to pursue the concept.

LEAN Project

Many companies start LEAN management as a project in one area of the value chain. The following figure shows the high rate of initial LEAN projects in Austrian companies.

Figure 2
LEAN Project



Source: Authors' Illustration

Of 222 LEAN management implementations, around 65% were started as projects. With this approach, it is important to note that the transition from project to the program must take place successfully. Otherwise, LEAN management is completed as a project and is not pursued sustainably. This means that the concept cannot be fully exploited.

Transition from project to program

The following Likert scale question is intended to show whether this transition was handled smoothly in the companies, with the preferred rating of the statement 'fully agree'. The results are shown in Table 2.

Table 2
Transition from project to program

Preferred answer: ‚fully agree. ‘	Do not agree at all	Somewhat agree	Tend to agree	Fully agree
The transition from the LEAN project to the LEAN program was carried out smoothly.	13,9%	**43,1%**	37,5%	5,6%

Source: Authors' Illustration

As the results show, only 5.6% of the participating companies that started LEAN as a project have made the transition to a sustainable program. The majority, 43.1%, only somewhat agreed with this statement, and for 13.9%, the transition was impossible.

Discussion

In this section, conclusions are drawn about the evaluation of the questionnaire, summarising all the anomalies that were identified from the participants' answers. The results, which were evaluated from the questions of the questionnaire in category 1, show no clear patterns related to the company sector and number of employees in the company, whether LEAN management is applied or not. In large companies with a staff of over 100 MA, 79.3% (of 222 participants) apply LEAN management. Contrarily, 68% (out of 44 participants) of this company size do not apply the management concept. The industries with the highest frequency in which LEAN management is applied are similar to those in which LEAN concepts are implemented.

Success factors in LEAN management

To avoid a lack of implementation of LEAN management, the awareness of LEAN managers about the importance of sustainable implementation can bring about improvements. Leaders can be convinced to exemplify the concept to their employees, which increases motivation to follow it. Through comprehensive communication and LEAN Change management, LEAN management can subsequently be implemented along the entire value chain of companies. Since numerous positive results have been achieved through LEAN management, other areas in the company can also be convinced that the application makes sense, provided that the results are shared company-wide. By involving the employees, further potentials and approaches are released, whereby, on the one hand, resistances are intercepted, and on the other hand, further positive results can be generated.

Limitations, complications, and weaknesses in LEAN management

The limitations, complications, and weaknesses that occur in Austrian companies regarding LEAN management can be explained by the lack of an unsustainable implementation of the management concept. Although some companies do not adjust inventories to market demand, based on the participants' comments, it cannot

be assumed that there is a widespread over-optimised application of LEAN management. Rather, the resistance of employees and the lack of examples set by managers at all hierarchical levels are major factors in why LEAN implementations and sustainable pursuit fail.

Conclusion

This research recognises that Austrian companies do not practice LEAN management intensively. Further, implementation weaknesses prevent the full exploitation of the potential. To that end, frequently occurring resistance from employees limits a smooth implementation. The future development of LEAN management will be the connection of LEAN and I4.0/I5.0. Well-founded and sustainably implemented LEAN management, waste-free and lean processes are the basis for the implementation of I4.0/I5.0. In the context of digitalisation and the application of both approaches, companies can generate an enormous increase in productivity and a resulting increase in sales. The combination of LEAN and I4.0/I5.0 will be the future development of the concept. When implementing I4.0/I5.0 in companies, it is a good idea to build on already LEAN processes in order to use and expand efficiency criteria that have been generated, creating new opportunities for companies. The authors recommend investigating if the results of the study can be validated with companies in other regions and different industries as well.

References

1. Best, D., Hurtz, A. (2018) Raus aus der Lean -Falle LEAN erfolgreich zur Gewohnheit machen, 3. Auflage, Business Village, Deutschland.
2. Drew, J., McCallum, B., Roggenhofer, S. (2005) Unternehmen LEAN Schritte zu einer neuen Organisation, Campus Verlag, Frankfurt.
3. Groth, U., Kammel, A. (1994) Lean Management – Konzept – Kritische Analyse –Praktische Lösungsansätze, Wiesbaden.
4. Kudernatsch Consulting & Solutions: Lean -Reifegrad-Studie 2018, (2018, July 23), https://www.openpr.de/news/1012186/Lean-Reifegrad-Studie-2018.html.
5. Kudernatsch, D. (2021) Lean Management Benchmarkstudie 2020, Amazon Fulfillment Poland Sp. z o.o., Deutschland.
6. Lichte, A. S. (2016) Lean -Management Eine Schrothkur zur Verschlankung, Klecks Verlag, Deutschland.
7. Mahleb, E. (2021, October 1) Change Management ist tot – lang lebe Lean Change Management, https://klardenker.kpmg.de/customer-insights-hub/change-management-ist-tot-lang-lebe-das-lean-change-management/

About the authors

Dipl.-Ing. Melinda Urban, BSc began an apprenticeship as a materials technician and started her part-time bachelor's degree in industrial management relatively simultaneously. After absolving this education, she began the fulltime master's program 'International Industrial Management' at UAS Joanneum in Kapfenberg, which she successfully graduated in July 2022. Since then, she has been working at voestalpine BÖHLER Edelstahl as a specialist in quality management. She can be contacted at email: **melinda_urban@gmx.at**

Dipl.-Ing. Dr. Wolfram Irsa, CIRM, CFPIM is a PhD graduate from the International Joint Cross-Border PhD Programme in International Economic Relations and Management at FH Burgenland in Austria. He passed his Rigorosum at the University of Sopron in June 2020 with summa cum laude. After a career in the semiconductor industry for more than 20 years, he is now a part-time docent and lecturer for high-tech engineering and presents at scientific international conferences. The author can be contacted at email: **wolfram.irsa@gmail.com**