UNIVERSITATEA LUCIAN BLAGA DIN SIBIU

Doctoral School for Engineering Sciences and Mathematics

Doctoral Study Field: Engineering and Management

PHD DISSERTATION

Lean University: Implementing New Methods and Concepts. From Pushing Improvements to Pulling Creative Thinking and Innovation with Design Thinking

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List of Abbreviations

Abbreviation	Description
CI	**Continuous Improvement**
DT	**Design Thinking**
US - NRC	**United States National Research Council**
PAR	**Participatory Action Research**
PBL	**Problem Based Learning**
SERP	**Strategic Education Research Partnership**

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Keywords

- Lean University;
- Continuous Improvements;
- Design Based Implementation Research;
- SERP Model;
- Design Thinking.

Summary

To accomplish the scientific endeavor, the thesis has been structured into 10 chapters, 108 pages, 11 tables, 35 figures and two annexes as follows:

Chapter 1 – Introduces the need for continuous improvement in the manufacturing industry and in engineering education as well as challenges and requirements that come with new 21st century skills.

Chapter 2 – The novelty of this thesis is the exploratory case study methodology that not only addresses the industrial (manufacturing) sector, but also various aspects of the educational sector and educational management and strategy when it comes to continuous improvement initiatives, challenges and opportunities to change. The motivation for this research comes from the author's experience working as a continuous improvement engineer, as the first employee to implement a continuous improvement culture inside a manufacturing company more than ten years ago and as the first employee of a new structure inside a Romanian university to use design to take on continuous improvement activities in Higher Education.

Chapters 3, 4 and 5 look at the existing literature on Lean Manufacturing, Lean in Higher Education and the combination or lean and agile approaches in Higher Education and in the industry. Besides Lean, which is probably one of the most written and talked about CI method in manufacturing after the Toyota Production System, the thesis also looks at some of the most popular CI initiatives and used method in Higher Education.

Two case studies have been created based on qualitative data obtained through interviews and focus groups with experts in five employers nominated as top of the industry in 2019 and also with data from Higher Education Educators obtained through two institutional projects in Romania. Here the idea emerged to use agile methodologies and ways of working in sprints and iterative cycles in order to test and implement lean methods of working. Design Thinking, being and iterative, creative problem solving method, seemed like a good starting point.

Chapter 6 focuses more on the reasons why CI initiatives in Higher Education fail or are not scaled after pilot projects. Besides the barriers and opportunities identified in the literature, a third case study is created based on three smaller design interventions created inside a university in Romania between 2020 and 2024. These design interventions are the result of the author's research, but also continuous learning and exploration of various Design Thinking approaches (starting with the HPI Design Thinking approach in 2019, Educational consultants approach in 2018, 2020 and 2021, Stanford d.school approach, d-school Afrika approach and

Design Thinkers Academy approach). Although DT is often used as a recipe by non-researchers and sometimes even without going through all process steps, except for the Google famous five day sprint (Knapp, Zeratsky, & Kowitz, 2016), there is no model with time slots for each DT stage or instrument. There are around 84 instruments and short activities published by the Stanford d.school in 2021 (Stein Greenberg, 2021), so it is clearly a matter of choosing the right activity and instrument according to the challenge a team is working on solving or according to the aim of the workshop. This is the reason why the exploratory research was conducted and a lot of iterations of the formats were designed. From a two-day format for the first iteration in September 2020, to a four-day format in 2021 and then even to ten-week courses in 2022. All three formats were chosen and designed by the author and continuously adapted according to feedback and observations during the sessions.

Chapter 7 – By looking at new methodology and new models and structures implemented in the United States of America (Science Shops, SERP Model, Design Based Implementation Research) and adapting those models to local context, by using the data obtained in all three case studies, plus a CI Readiness Questionnaire, this thesis proposes a new structure and model of working for universities in Romania that want to implement and scale CI initiatives and projects.

Chapters 8 and 9 present the author's contributions and conclusions, divided into 3 categories: CI readiness, barriers and opportunities in implementing CI initiatives and programs in Higher Education and Design Thinking as a strategy to overcome resistance to change and organizational barriers and work on initiatives that can foster CI readiness, by creating new structures that combine design, research and education inside an interdisciplinary team. Chapter 10 contains the bibliography.