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DEVELOPING THE LEAN ATTITUDE: CASE STUDY OF TRAINING ROLE AT THE UNIVERSITY

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Purpose: This paper investigates how Lean training fosters the Lean attitude among university employees, focusing on the motives and barriers influencing this transformation. Emphasis is placed on understanding the change process, the conditions for its success and its effects.
Design/methodology/approach: An integrative literature review and case study approach were employed. Document analysis covered the period from 2017 to 2023. In 2023, an interview questionnaire was conducted among university employees who had participated in Lean training between 2019 and 2023. A total of 38 respondents completed the survey. Data were analysed using content analysis (open and axial coding) and statistical techniques.
Findings: Lean training had a positive impact on work attitudes in cognitive, affective and behavioural dimensions. However, due to existing barriers, these changes remained confined to individual workplaces. This limitation negatively affected job satisfaction, willingness to continue working, perceived career development opportunities and sense of agency. Preliminary statistical modelling suggests that the affective dimension of the Lean attitude primarily influences Lean behaviours.
Originality: This case study provides novel insights into the development of the Lean attitude through training, an area underexplored in management theory, especially in public universities. The study introduces the Lean Attitude Transformation Model (LATM), tailored to higher education, and supported by a newly developed survey tool.
Practical implications: Understanding the mechanisms behind Lean attitude development enables managers to foster a culture of continuous improvement through effective training programmes, eliminating barriers and reinforcing motivation.
Research limitations: This study simplifies the attitude concept to illustrate its transformation process clearly. Statistical analyses are preliminary due to the small sample size.
Keywords: Lean attitude, Lean management, continuous improvement, training.
Category of the paper: Research paper, Case study.

1. Introduction

Lean management (Lean Higher Education LHE) has been applied in higher education for over 30 years, yet its long-term sustainability remains debated. Resistance to changes is explained by limited attention paid to developing a culture of continuous improvement (Antony et al., 2012; Cano et al., 2016; Maciąg, 2019; Malik, Abdallah, 2020). Literature increasingly recognises that organisational culture and Lean attitudes are critical to lasting improvements (Dragomir et al., 2013; Emiliani, 1998; Ballé, 2005). Despite growing attention to culture and leadership in Lean (van Assen, 2018; Latif, Vang, 2021; van Dun, Wilderom, 2015), individual employee attitudes remain underexplored (Duggan et al., 2023). Ballé (2005) identifies the "Lean attitude" as a key but missing link in the transformation of an organisational culture towards one emphasising continuous improvement (Ballé, 2005). Training is seen as essential to Lean implementation (Atkinson, 2010; Arumugam et al., 2012; Maciąg, 2019; Antony et al., 2012). However, we still know little about the mechanism of changes in the Lean attitude and the conditions for a successful change, especially in public universities.

This article examines the impact of Lean training on developing the Lean attitude and investigates enablers and barriers within the university context. It posits that while Lean training supports attitude change, its success depends on institutional conditions. Research objectives are to build a theoretical framework for further research on Lean attitude (cognitive goal), validate the research tool and identify change factors (methodological goal), and support training-based implementation and motivation (practical goal). The research applies an integrative literature review and a qualitative case study design.

2. Theoretical background

Given the diverse literature on the Lean attitude, an integrative review (Torraco, 2005) was conducted. The study examines the Lean attitude, its meaning, expected changes from Lean management and the role of training. This analysis determined the wording of research questions and hypotheses, with findings presented below.

2.1. Lean management and culture of continuous improvement in HEIs

Lean Management was introduced in education in the 1990s, initially as part of TQM, waste reduction and Kaizen initiatives (Balzer, 2020). Evolving from the Toyota Production System, Lean has become a philosophy of organisational improvement (Liker, 2018). Lean core principles focus on continuous improvement by eliminating waste and optimising the flow with respect for people (Womack et al., 2000). Research indicates that LHE improves service

quality, resource utilisation, communication, management transparency and employee satisfaction (Balzer, 2020; Radnor et al., 2011; Emiliani, 2015; Antony, 2014; Hines, Lethbridge, 2010; Cano et al., 2016), positevely change organisational and work culture (Maciąg, 2019; Maciąg et al., 2022) and leadership (Balzer et al., 2016). Lean is a holistic cultural transformation requiring commitment of leaders, an improvement strategy, supporting and training system (Liker, 2018). Understanding readiness for change is another key factor (Antony, 2014; Maciąg, 2019).

However, numerous barriers have been identified. Directly adapting business methods to an academic culture is risky and can lead to failure (Lu et al., 2017). Strategic structures are not accustomed to rapid change, and, as could be expected, what constitutes the real challenge is the engagement and commitment of employees (Hines, Lethbridge, 2010). Problems include difficulties in understanding the related terminology (gemba, heijunka, internal customer) (Klemm et al., 2013), the functioning of Lean teams and their cooperation with senior management (Thirkell, Ashman, 2014), the lack of managers' commitment or their focus on the most obvious benefits (Ballé et al., 2019), the identification of the sources of waste (Douglas et al., 2015), employees' commitment (Grudowski, Wiśniewska, 2019), as well as the silo mentality and the blame culture (Maciąg, 2019).

Balle emphasises that Lean success depends on employees' mindset change, making attitude transformation a core element of sustainable implementation (Ballé et al., 2019). Thus, if one wants to change an organisation, first one has to change oneself.

2.2. Defining the Lean Attitude: Features and Dimensions

The concept of Lean attitude remains underdeveloped. Various definitions of this concept were proposed by Emiliani (1998), Ballé (2005) and Beale (2008), with Emiliani and Beale focusing mainly on one dimension of the Lean attitude, namely Lean behaviours.

Using the social psychology attitude definitions (Cacioppo et al., 1994; Wojciszke, Grzyb, 2024), followed Ballé (2005), authors defined Lean attitude as an enduring tendency to judge the Lean philosophy positively or negatively, which manifests itself through cognitive, emotional and behavioural responses in the process of organisational improvement. Lean attitude can be described by means of such qualities as content, scope, direction, intensity, complexity, strength, compliance, sustainability and validity (Kaźmierczak et al., 2023; Wańczyk-Welc, 2024; Wojciszke, Grzyb, 2024). Operational definition of Lean attitude includes: content (the Lean philosophy and its application), scope (training, practice, teams, projects), direction (judgement of Lean's usefulness), intensity (strength of positive/negative assessment), complexity (multi-dimensionality), strength (associating Lean with success/failure), internal consistency (alignment across cognitive, affective, and behavioural elements), durability (sustained habit change), and importance (link to self-concept and values). In pursuit of the cognitive objective of the article, the concept of Lean attitude, its characteristics

and dimensions, the relationship between the dimensions and methods of measuring attitude change were defined. The results of the analyses conducted can be found in Table 1.

Attitudes affect how people perceive and process information. Because individuals prefer consistency, changes in attitude, especially affective, can be difficult but are essential for behavioural change (Zimbardo, Leippe, 2004; Wojciszke, Grzyb, 2024). This is why changing attitudes becomes such a major challenge in the change process.

The authors characterised the respective dimensions of the Lean attitude and the manners of assessing change in it under the stimulus of Lean training (Table 1). The cognitive dimension reflects an individual's beliefs about Lean, such as perceptions of their role at work and understanding of Lean tools and principles. These beliefs, shaped by both internal (e.g., experience, preferences) and external (e.g., training, organisational culture) factors, are central to one's perception of Lean (Wojciszke, Grzyb, 2024; Ballé et al., 2019). The affective dimension relates to emotional responses towards Lean, which may function independently from beliefs. It includes feelings such as motivation or frustration and indicates whether Lean evokes positive or negative associations (Wojciszke, Grzyb, 2024). The behavioural dimension concerns observable actions and intentions consistent with Lean philosophy (Table 1). Emiliani (1998) defines these as value-adding behaviours, in contrast to inefficient, non-Lean ("fat") behaviours. Behaviour is considered a true expression of attitude only when voluntary, not imposed by organisational structures or norms (Bakanauskas et al., 2020). It is emphasised that if we behave positively towards an object of our attitude, then this attitude is positive (Wojciszke, Grzyb, 2024; Bakanauskas et al., 2020).

Table 1.
Dimensions of the Lean attitude – a conceptual research framework

Lean attitude dimensions	**Subject of assessment – reactions to Lean training**
Cognitive dimension	Subject of assessment: verbal expressions of beliefs, values, and knowledge. The assessment focuses on employees' understanding of improvement concepts and tools, their perceived benefits, and resulting shifts in self-perception at work. Key dimensions include: • Knowledge of Lean philosophy, its purpose, principles, methods, and techniques (Ballé, 2005; Ballé et al., 2019). • Self-perception in terms of performance, collaboration, and workplace relationships (Ballé et al., 2019; Liker et al., 2018; Maciąg, 2019). • Openness to change and criticism, and the ability to analyse complex problems (Ballé, 2005; Maciąg, 2019). • Motivation to learn, experiment, and enhance qualifications (Maciąg, 2019).
Affective dimension	Subject of assessment: emotional reactions and verbal declarations. Employees respond positively to Lean-based organisational improvements, particularly concerning: • Motivation, work engagement, and learning (Ballé, 2005; Beale, 2008; Maciąg, 2019). • Job satisfaction, confidence, and fear (Ballé, 2005). • Emotional responses to waste, often experienced as frustration (Ballé, 2005; Liker et al., 2016). • Perceived development opportunities, sense of influence, empowerment, and meaning at work (Ballé et al., 2019; Beale, 2008; Liker et al., 2016). • Willingness to break routines, express opinions, and distance oneself from legacy solutions (Maciąg, 2019).

Cont. table 1.

Behavioural dimension	Object of assessment: observable behaviours and verbal statements indicating behavioural intentions. Employees demonstrate a willingness to apply Lean principles and tools. The behavioural dimension of the Lean attitude includes: • Implementation of Lean principles such as respect for people, waste elimination, value creation, flow, pull, continuous improvement, teamwork, and gemba (Ballé, 2005; Ballé et al., 2019; Liker et al., 2018; Mann, 2014). • Use of visual management and problem-solving techniques (Ballé, 2005; Beale, 2008; Liker et al., 2016; Mann, 2014). • Application of standardisation, work-life balance, risk and knowledge management, communication, and learning by experimentation (Ballé, 2005; Ballé et al., 2019; Liker et al., 2018). • Adjustments in daily habits, process orientation, and avoidance of blame-oriented thinking or stereotypes (Liker et al., 2018; Mann, 2014; Ballé, 2005; Emiliani, 1998). • Setting ambitious goals, maintaining a critical stance on performance, and proactively seeking solutions (Ballé, 2005; Ballé et al., 2019; Liker et al., 2016, 2018).

Source: own elaboration.

The cognitive dimension may have the greatest influence on Lean behaviours, especially at the initial stage of the Lean implementation process (Ballé, 2005; Liker et al., 2016). However, it is important to remember that the affective dimension can reinforce or undermine behavioural changes. If employees feel they are being forced to implement Lean without being positively emotionally engaged, they may resist (McNamara, 2014). Practicing Lean requires positive changes in both cognitive and affective dimensions (Ballé, 2005). According to the Theory of Planned Behaviour (Ajzen, 1991), a positive attitude, perceived social approval, and confidence in one's ability increase the likelihood of intending—and ultimately performing—a behaviour.

2.3. Developing the Lean attitude through training

Toyota's philosophy stresses that time not used for learning is wasted (Liker et al., 2016). Thus, training is critical to develop competencies through both structured learning and daily problem solving (Liker et al., 2016; Sinha, Allan, 2013). The literature often mentions training as an essential factor influencing the success of Lean programmes (Dinis-Carvalho, 2021; Zanchi et al., 2024), especially in the first stages of implementing Lean in an organisation. It facilitates the introduction of change, especially within the framework of Lean (Stanica, Peydro, 2016; Abu et al., 2019). Without adequate training, Lean programmes fail (Ichimura et al., 2008). In practice, there is a consensus that if Lean is to contribute to cultural change, employees must be trained in using Lean tools and techniques (Atkinson, 2010). However, this opinion has not been supported by research. Employee participation in on-the-job training programmes positively influences job satisfaction and organisational commitment (e.g. Sahinidis, Bouris, 2008; Ryu, Moon, 2019). It is emphasised that satisfaction levels are influenced by employees' perceived level of Lean implementation in the organisation (Müller, Leyer, 2024). Employee training should contribute to increased trust, loyalty and motivation (Liker et al., 2016). However, what should be taken into account is that the understanding of the benefits of Lean management, its theory and terminology is significantly influenced by employees' positions in organisational hierarchies and their level of education (Adam et al.,

2021). Research on the relevance of training in Lean implementation refers to its effectiveness and role in preventing failure (Ichimura et al., 2008; Dinis-Carvalho, 2021). Studies conducted at universities indicate that training that combines traditional learning methods with active methods is most effective, as it allows the development of both hard and soft skills (Lista et al., 2022). Previous research points to the importance of training and critical observation, which improves organisational learning, promotes employee engagement and offers experiential learning (Arumugam et al., 2012).

In the implementation of Lean training programmes, many organisations focus on the cognitive dimension of the Lean attitude and limit their assessments of training effectiveness to change in knowledge. However, from the point of view of a holistic approach to assessing change in attitudes, this is insufficient (Ballé, 2005). An assessment of behaviours and their consequences for the organisation are very important (2021), which is also highlighted in the Kirkpatrick model. Selecting methods to assess change in attitudes as a result of training is still a challenge for researchers in this area. Research is complex and can be conducted in the form of participatory observations, questionnaire surveys, free interviews, competence increment surveys and comparative groups (Bugdol, 2011; Oppenheim, 2004). The objects of interest in an attitude change study are verbal statements of beliefs, values and knowledge as well as an assessment/self-assessment of employees' knowledge (cognitive dimension). The methods that can be used in such a study include surveys (opinion surveys, cognitive self-assessment of knowledge), interviews, observations (e.g. observations of behaviours, emotions) and analysis of organisational documentation (e.g. documents concerning improvement projects, a register of improvement ideas submitted in the Kaizen system). The most commonly used assessment scales in survey research are the Likert scale, dichotomous scale (good/bad, desirable/undesirable, etc.), percentage scale or ordinal scale in self-assessment of knowledge. The scope of assessment may include an employee, their workplace, as well as direct relationships with superiors and colleagues.

In conclusion, Lean training is a core component of change programmes, aiming to shape a positive Lean attitude across cognitive, emotional and behavioural dimensions. This attitude should exhibit positive direction, strength, consistency and sustainability. However, research on how Lean training influences such attitudes, particularly in universities, remains limited. There is also a shortage of theoretical models and tools for measuring these changes, which presents both theoretical and practical challenges. In the public sector, especially higher education, assessing the benefits of Lean training through quantitative metrics like cost or time savings is particularly difficult.

3. Research methodology

An exploratory in-depth case study was employed to examine the phenomenon within its real-life context, especially where its boundaries were unclear (Yin, 2014). The study was grounded in existing theoretical propositions and aimed to develop a broader nomothetic theory (Babbie, 2013). The objective was to build a more general nomothetic theory for further research (Babbie, 2013). A single-case approach was appropriate due to the unique nature of the setting and its potential to critically test existing theories (Rowley, 2002). To ensure generalisability, validity and reliability, the research followed established case study protocols: formulating questions, selecting the case, developing tools, collecting and analysing data, and generating theoretical insights (Rowley, 2002). Attention was paid to construct, internal, and external validity, as well as reliability through transparent and replicable procedures. All university data were anonymised.

3.1. Case study of the university

Based on the literature review, the following research questions and hypotheses were formulated:

RQ1: To what extent did the training influence the cognitive, affective and behavioural dimensions of Lean attitude among employees and how are these dimensions interrelated?

T1: Lean training is expected to positively impact the cognitive (knowledge) and affective dimensions of attitude. Due to its practical orientation, behavioural changes—such as the conscious application of Lean principles—are also anticipated. However, Lean tools in universities are typically simpler and adapted for individual use (Emiliani, 2004; Radnor et al., 2006; Cano et al., 2016; Balzer, 2020; Maciąg, 2019).

RQ2: What motives and barriers affect the development of the Lean attitude at the university?

T2: Key barriers are assumed to stem from the organisational system (e.g., functional silos, formalism, absence of a process orientation), lack of motivational mechanisms (Merkac-Skok, 2013) and weak communication (Maciąg, 2019).

RQ3: How should Lean training be redesigned to more effectively foster Lean attitudes?

T3: The current training model requires revision. Modifications relating to the Lean attitude are expected (Ballé, 2005).

This case study aimed to assess the extent to which Lean training at the university shaped employees' Lean attitude and to identify key motives and barriers to this change.

3.2. Case selection – rationale for undertaking research at the university

The case study was conducted at one of the largest public universities in Central Europe, which had been undergoing structural and digital transformations to enhance process efficiency and service quality. Internal reviews identified challenges typical of public sector institutions, including procedural complexity, parallel paper-digital workflows, and limited responsiveness of administrative units.

In response, the university launched a comprehensive Lean training programme between 2019 and 2023, targeting employees across departments and levels. The programme, spanning 40 hours and delivered in various formats (on-site, online, blended), aimed to promote a shift toward process-oriented thinking and cultural improvement. Although it was intended as a foundation for broader institutional transformation, structural changes were not fully implemented during the programme's lifespan.

3.3. Development of data collection and analysis tools for the case study

In order to investigate the development of the Lean attitude, the authors prepared a dedicated and anonymous questionnaire of a categorised interview based on the dimensions described in Table 1. They focused on declarative attitudes, i.e. fully conscious and linguistically expressible ones (Wojciszke, Grzyb, 2024). In order to reduce the impact of limitations typical of this type of research (e.g. lack of knowledge, need for social approval of the respondent in the eyes of the questioner), the questionnaire was emailed only to those employees who had completed a full cycle of Lean training. The respondents had direct contact with the object of the attitude. In the research questionnaire, it was possible to explore all dimensions of the Lean attitude (Bakanauskas et al., 2020; Eagly, Chaiken, 1998). The questionnaire was anonymous.

The tool was structured into four parts: introduction, attitude change, motives/barriers and demographic data. It included both closed- and open-ended questions, using ordinal (Likert), nominal and interval scales (Table 1). Open-ended responses aimed to explore mechanisms of attitude change. Due to the small sample size, statistical analyses were preliminary. However, a reliability analysis using SPSS showed high internal consistency (Cronbach's $\alpha \approx 0.9$ for all attitude dimensions). The electronic questionnaire was built in Microsoft Forms.

Qualitative data from open-ended responses were analysed using content analysis techniques, including word frequency, open coding and axial coding (Babbie, 2013; Konecki, 2000; Kaiser, Presmeg, 2019). Open coding aimed to identify the dominant codes and categories emerging from the respondents' statements (Babbie, 2013; Creswell, 2013; Charmaz, 2009; Konecki, 2000; Kaiser, Presmeg, 2019). In the open coding process, data were assigned concept-driven codes resulting directly from the open-ended questions about changes in the Lean attitude. The codes were the following: motives for participating in the training, motives for change, habits, improvement project and barriers to change. During the open coding process, data-driven codes and in vivo codes emerged from the text.

Axial coding was applied to deepen the understanding of changes in the Lean attitude and to develop initial assumptions for a middle-range theory of attitude transformation through training. Following recommendations by Konecki (2000) and Kaiser and Presmeg (2019), the coding paradigm was structured around six subcategories:

- Phenomenon – the core focus of the study (Lean attitude).
- Context – the organisational, temporal and spatial setting of the phenomenon.
- Causal conditions – initial factors triggering change.
- Intervening conditions – variables influencing the course and intensity of change.
- Strategies – actions taken and interactions initiated in response to the phenomenon.
- Consequences – observed outcomes resulting from these actions and interactions.

These categories were derived from responses provided by the participants and document analysis. The results of both open and axial coding are illustrated in Figure 1. In line with Charmaz's (2009) grounded theory approach, the analysis remained closely tied to original data. Coding and content analysis were conducted using NVIVO 12 (LUMIVERO) and the full report was prepared following Konecki's (2000) methodological guidelines.

3.4. Field research – data collection

The selection of the research sample was purposive. A link to the questionnaire was sent to 175 people who had completed the full above-mentioned Lean training (17% of them had inactive email addresses, which meant that they were no longer university employees). The authors received 38 completed questionnaires, which represented 26% of those invited to participate in the survey. The survey lasted from 8 September to 8 November 2023. Most respondents (66%) were non-managers and 84% worked in administrative roles. A majority lacked prior experience with improvement methods—68% had never attended Lean-related training, and 61% had not applied such methods at work. Only 16% completed Six Sigma (Green Belt) training at the university, while 32% engaged in external professional development (e.g. courses, postgraduate studies, LHE Poland network seminars).

4. Results

The survey results are presented in the order in which answers were provided to the questions and hypotheses formulated for the case study.

4.1. Change in the cognitive, affective and behavioural dimensions of the Lean attitude.

With regard to the cognitive dimension, pre- and post-training tests revealed a significant increase in the knowledge of Lean concepts, with average scores rising from 40% to 90%.

The respondents reported improved cognitive attitudes, including greater work efficiency (71% of the "yes" and "rather yes" answers), task focus (81%), openness to change (81%), attentiveness (86%) and a desire to further develop Lean competencies (95%). The training also influenced workplace relationships: 68% noted improved peer relations, though only 45% felt it enhanced relations with superiors. Changes in the perception of Lean values, principles and habits were moderate. The core values such as respect, continuous improvement and waste elimination had already been embedded in daily work (over 87%). The principles such as flow, value stream and pull were widely applied and 86% reported habit changes. As one respondent noted [code habits, ref.1]: "I've started to regularly analyse the space around me – to take care of its order, layout and sense. I've started to write down my tasks/processes and put them on my Kanban. This allows me to know at what stage of fulfilment my tasks are and make better use of my working time. Since completing the Lean course, I have taken several classes to improve my competencies (process automation in PowerAutomate or PowerBi). I am also becoming more critical or inquisitive by asking "why?" questions. The crux of several problems has already been found".

Regarding the affective dimension of attitudes (emotions related to work), responses were more varied. Most participants (87%) felt more motivated to improve post-training, with 55% reporting stronger commitment, 52% greater role awareness and 73% feeling more willing to share opinions and detach from old work habits (71%). However, only 24% believed the training had expanded their professional development opportunities within the university. About half reported overcoming routine and monotony, while just 37% experienced greater work meaningfulness and 34% felt more influence over their work processes. Only 52% noted increased job satisfaction. These results suggest that affective change is likely constrained by existing institutional barriers.

Furthermore, quantitative data suggest that the respondents developed Lean behaviours, applying Lean principles more consciously at work. Key practices included identifying customers (61%), mapping processes (63%), analysing problems (79%), balancing workloads (78%), identifying waste (63%), standardising work (63%), managing risk (63%), stopping work when issues arise (61%), effective communication (87%), sustaining changes (65%) and data-driven decision-making (87%). Only one respondent reported not using any Lean tools; most applied multiple techniques (Consequences Fig. 1). Popular methods included brainstorming (81%), Kanban (47%), visual management (37%), 5Why's (29%), value stream mapping (24%), flowcharts (21%) and others like 5S, Pareto, whiteboard meetings (13%) and waste audits (10%). Improvement project themes involved process optimisation, communication enhancement and Lean tool implementation. Axial coding (Fig. 1) illustrated post-training behavioural changes, highlighting complex factors influencing Lean adoption. Behavioural shifts emerged as action and interaction strategies [code: goal, ref. 1-15; actions, ref. 1-6], including team planning and collaborative projects (e.g. "our office",

"in the department") [code: interactions, ref. 1-7]. This shows participants understood both how and why to use Lean tools (cognitive dimension).

Initially, it was hypothesised that the cognitive dimension most strongly influenced behaviour. However, correlation analysis ($p < .05$) showed a stronger link ($r = 0.7$) between the affective and behavioural dimensions, with other correlations between 0.5-0.6. Regression results confirmed the model's significance ($R^2 = 0.45$), indicating that affect accounts for 45% of the variance in Lean behaviours. A 1-point rise in affective scores predicted a 0.45-point increase in behavioural outcomes, suggesting affect plays the dominant role.

4.2. Conditions to change the Lean attitude (motives and barriers)

The quantitative analysis identified major barriers to Lean implementation at the university. These included insufficient knowledge of Lean among employees and managers (both 87%), resistance to change (employees 79%, managers 76%), lack of commitment from top management (92%) and immediate superiors (87%), inadequate support for Lean/change leaders (74%), absence of incentives (92%), poor communication (89%) and excessive bureaucracy (92%). Despite these challenges, key motivators for training participation included personal curiosity, the desire for change and hope for institutional transformation. This is reflected in the in vivo code: the beginning of change, and statements such as: "I hoped that the training was the beginning of the changes planned at the university to improve work quality" [ref. 1] and "I also hoped for many changes in my organisation" [ref. 2].

Axial coding (Fig. 1) indicated that these barriers became intervening conditions influencing behavioural change. The in vivo code there are no possibilities reflects this sentiment, as in: "Not everybody was persuaded to embrace change" [code: barriers, ref. 1]. Contextual barriers were further illustrated: "There are many undocumented and unstandardised processes, no clear process ownership, and significant wastage of human resources. Some employees resist self-improvement and show little interest in shaping organisational processes" [code: context, ref. 1]. Another respondent noted structural constraints: "[The university] does not allow for the practical application of Lean due to existing rules. Training is often theoretical—exciting and costly—but in practice, we must follow public-sector regulations" [code: barriers, ref. 3].

These findings support initial assumptions that institutional regulations pose a serious obstacle. Despite training, some participants remain sceptical about the practical feasibility of Lean implementation (Consequences Fig. 1).

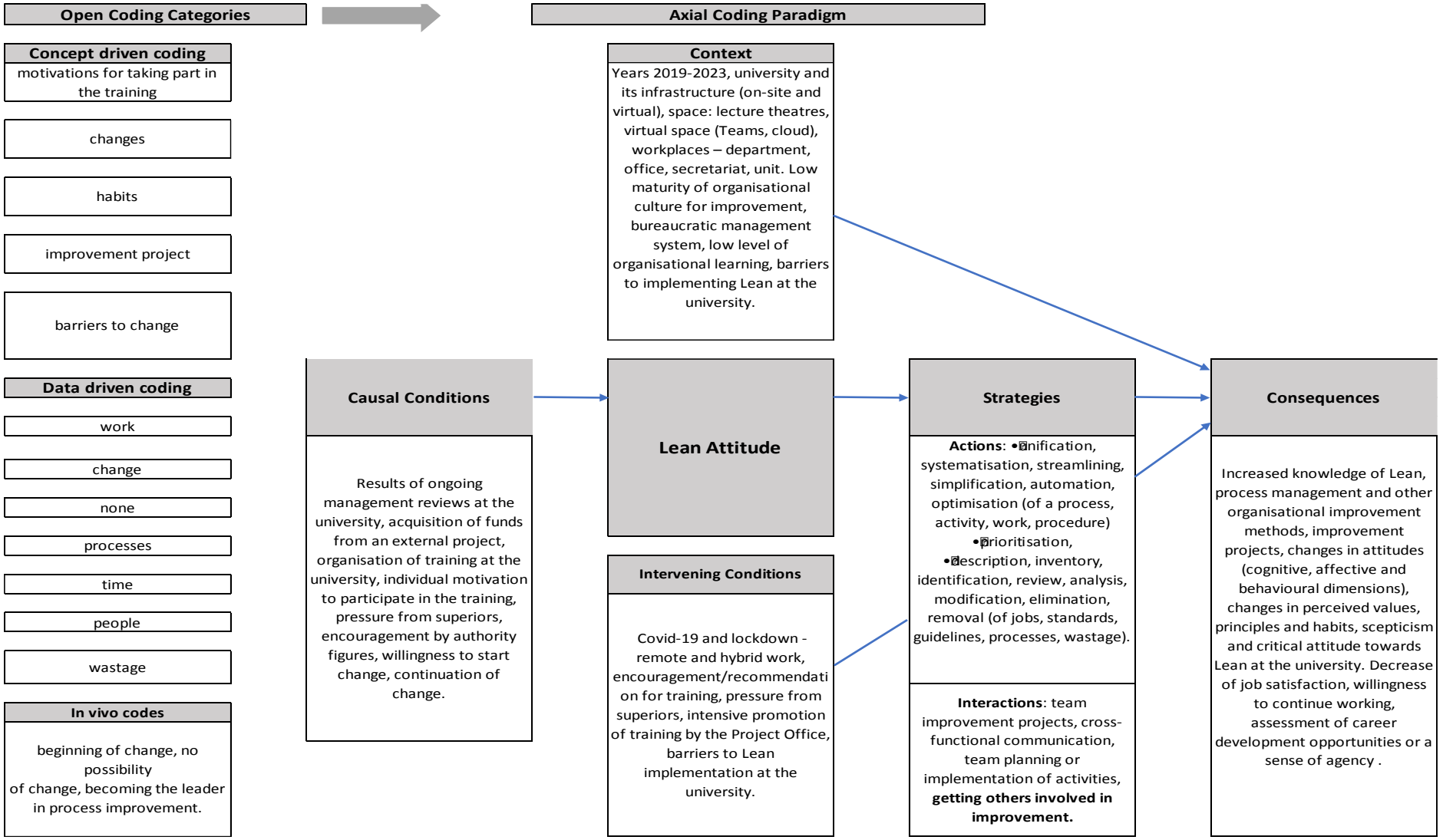

Figure 1. Results of the qualitative data analysis (open coding and axial coding).

Source: own elaboration.

5. Discussion

An in-depth case study conducted at a large public university shows the extent to which Lean training can influence the Lean attitude manifested in employee behaviours and the conditions for a such change.

The aim of Lean training is to shape the Lean attitude characterised by positive direction, strength, consistency and sustainability. However, the results of the survey indicate a lack of consistency in the strength and direction of change in the attitude. Training had a positive impact on the cognitive dimension of the Lean attitude, which is also confirmed by previous research (Liker et al., 2018). The survey participants began to apply Lean techniques, change routines and implement improvements. However, these changes were local and limited to individuals and teams, which confirmed the hypothesis of a fragmentary approach to change. This way of implementing Lean perpetuates a silo structure, contrary to the Lean philosophy (Ballé et al., 2019). While transformation should start with the workplace, local successes rarely translate into results for the whole organisation, and failure to deliver on the promises of change leads to disillusioned employees (Ballé et al., 2019). Importantly, preliminary statistical analysis showed that the affective dimension had a greater impact on Lean behaviour than the cognitive dimension. This result contradicts the hypothesis adopted on the basis of the literature, according to which the cognitive component dominates at the initial stage of Lean implementation (Ballé, 2005; Liker et al., 2016). It is presumed that the assessment of emotional reactions was strongly determined by the barriers to change existing in the organisation. Our research did not confirm positive correlations between training and job satisfaction, readiness for further employment, appraisal of career opportunities or a sense of agency (Adhikara et al., 2022; Afrifa Jnr et al., 2022; Sahinidis, Bouris, 2008; Ryu, Moon, 2019). As McNamara (2014) points out, a lack of positive emotional engagement can undermine the implementation of desired behaviours. At the same time, the literature remains ambiguous about the impact of the emotional component – emotions can be impermanent and unstable, (Bakanauskas et al., 2020) but can also initiate enduring attitudes (Wojciszke, Grzyb, 2024). The novelty of the study consists in analysing the mechanism of change in employees' attitudes and behaviours during the initial phase of the transition, under the influence of an intensive training programme. These results have not been studied more extensively to date and deserve further analysis.

The literature highlights the crucial importance of barriers to improvement (Lu et al., 2017; Hines, Lethbridge, 2010; Klemm et al., 2013; Thirkell, Ashman, 2014; Ballé et al., 2019; Douglas et al., 2015; Grudowski, Wiśniewska, 2019; Maciąg, 2019). Our study confirms their existence. We suppose that they have a significant impact on the emotional dimension of

attitudes and thus influence Lean behaviours. This issue requires further examination. Thus, if training is not an integral element of the change process (Maciąg, 2019; Kirkpatrick, Kirkpatrick, 2021) supported by cooperation (Bortolotti et al., 2015) and responsible leadership, it becomes a source of waste and a demotivating factor.

Our study revealed varied employee motivations for participating in training—some viewed it as the beginning of organisational change, aligning with findings by Ilić Petković and Nikolić (2020) and Cigularov and Dillulio (2020). Individual values and learning motives influence training effectiveness, with personal development being a frequent driver (Boomaars et al., 2018). Motivation also depends on perceived future opportunities and the value placed on learning (Kochoian et al., 2017). However, sustaining motivation over time remains a challenge once initial enthusiasm fades. Effective training requires organisational commitment to clear goal-setting and employee-centred strategies (Orpen, 1999; Merkac-Skok, 2013; Kochoian et al., 2017; Boomaars et al., 2018; Kim et al., 2019; Chen et al., 2020; Akther, Rahman, 2022). While hierarchical structures may offer advancement paths, this is effective only when linked to self-development. In contrast, administrative staff often lack opportunities to apply new competencies, which may explain why nearly one-third of participants left their jobs.

Our findings confirmed the need for revised training methods and appropriate workplace support, including motivation and empowerment, supporting our initial hypothesis and aligning with existing literature. Effective employee training depends on multiple factors: trainee characteristics (e.g., attitudes, values, personality), training design and situational context (Pilati, Borges, 2012). Key contributors include self-efficacy (Orpen, 1999), perseverance (Karp, Lee, 2000), motivation and clear goals (Merkac-Skok, 2013), sharing knowledge with peers, coaches or mentors (Merkac-Skok, 2013), knowledge-sharing, value placed on learning (Kochoian et al., 2017), personal development (Boomaars et al., 2018), the supervisor's support (Kim et al., 2019), appropriate methods, e.g. (Chen et al., 2020), as well as structured pre- and post-training activities (Akther, Rahman, 2022). Training alone is insufficient—its success is influenced by broader contextual and intervening conditions (EL Hajjar, Alkhanaizi, 2018; Ajzen, 1991). The effectiveness of training can be influenced by many other factors, as shown in Figure 1 (intervening conditions, context). In Lean training, linking Lean thinking to employees' values and beliefs, such as common sense, efficiency, or work-life balance, can shape emotional responses. According to Wojciszke and Grzyb (2024), affective evaluations are influenced by associative processes and repeated exposure. Enhancing training through success stories, practitioner communities, and credible trainers with real-world Lean experience may improve outcomes. The novelty of our study lies in its broader perspective on factors affecting training effectiveness, particularly in Lean. Future research should explore the role of peer support and self-efficacy and apply established evaluation models to compare employee perceptions with actual outcomes and managerial assessments.

6. Generalisation and Conceptual Framework of training-based Lean Attitude Transformation Model (LATM)

Building upon existing Lean attitude concepts, this study introduces an original three-dimensional framework (cognitive, affective, behavioural) grounded in social psychology and contextualised for public higher education (Figure 2).

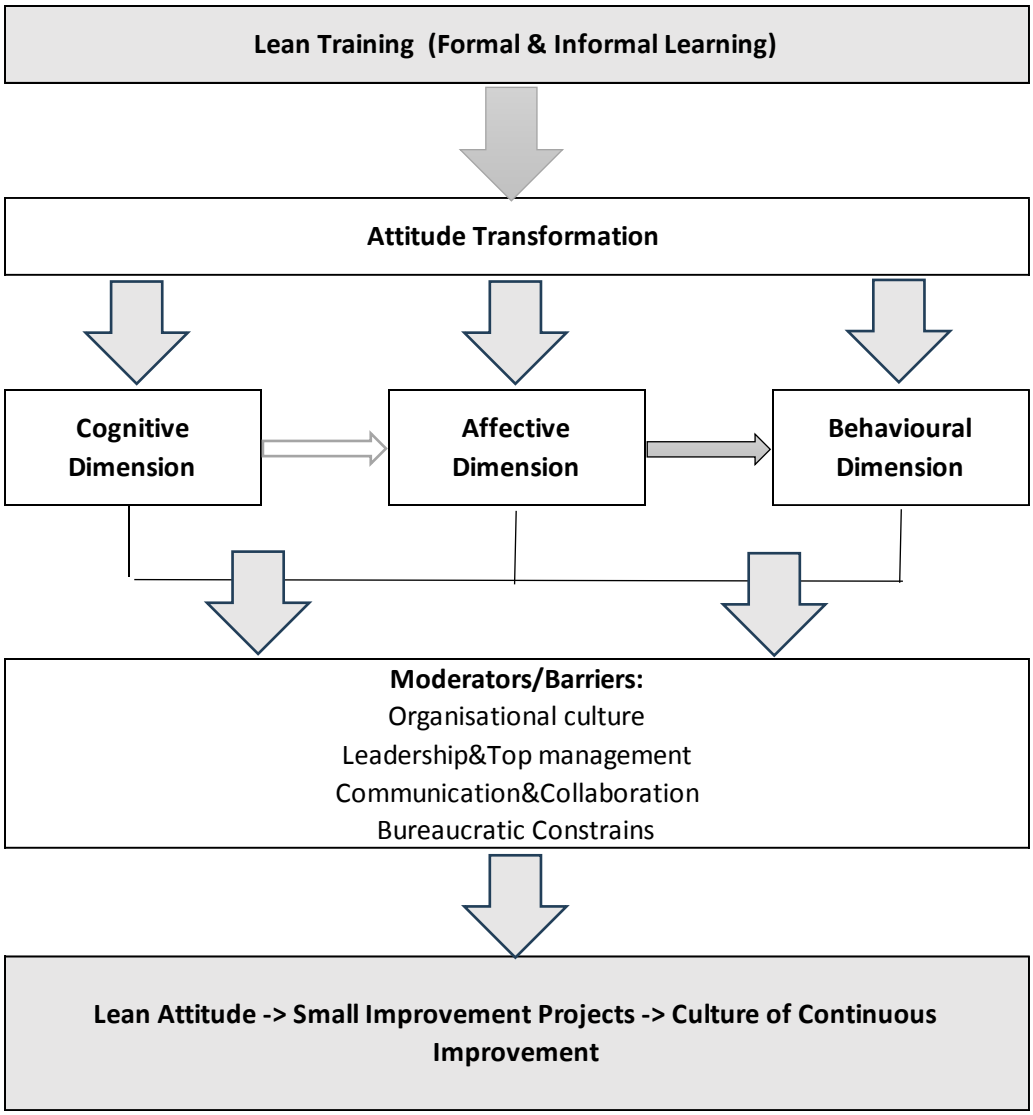

Figure 2. Conceptual framework for training based on the Lean Attitude Transformation Model. Source: own elaboration.

The framework integrates theoretical insights with observed relationships between cognitive, affective and behavioural dimensions of Lean attitude. Notably, the affective dimension emerged as a stronger predictor of Lean behaviour than initially hypothesised. The framework also incorporates contextual barriers identified in the data, which moderate the effectiveness of attitude transformation. Despite rich theoretical discussion on Lean culture,

no prior studies have provided a comprehensive, operational three-dimensional attitude model specifically tailored to public university settings. Our contribution fills this gap.

7. Managerial implications

To enhance the effectiveness of Lean training, organisations should redesign programmes to directly address institutional barriers and activate the affective dimension of employee attitudes. This includes linking Lean principles to employees' values (e.g., autonomy, efficiency, work-life balance), integrating training with everyday work through structured follow-up (e.g., coaching, mentoring), and fostering emotional engagement via credible trainers, practitioner networks, and success stories. Training should be embedded within broader change strategies, supported by leadership and peer involvement, with a focus on real application rather than symbolic participation. Special attention should be given to administrative staff, who often lack opportunities to use new competencies. Aligning training with clear goals, ongoing support, and development opportunities can sustain motivation and enable long-term behavioural change.

8. Limitations

The research was limited to the employees' perspective and one organisation. The article makes the necessary simplifications of the attitude concept to present the mechanism of its change clearly. Statistical analyses are of an estimated nature due to the small research sample.

9. Conclusion

The article fills a research gap regarding the impact of Lean management training on changing attitudes (the Lean attitude) and building a culture of improvement at the university. The novelty of the work consists in the use of a three-component model of attitudes to analyse such change. This framework - the Lean Attitude Transformation Model (LATM) - extends beyond previous work by integrating affective-motivational drivers and identifying institutional barriers that moderate behavioural outcomes. The model and survey tool developed allowed for an assessment of the direction, strength and consistency of change. The study shows that Lean training has a real impact on employee attitudes: Lean becomes a mindset, not just a set of tools.

However, the effectiveness of change is limited by cognitive, emotional, behavioural and organisational barriers. If training is not an element of a systemic transformation process, it becomes ineffective. Further research is needed into the mechanisms of attitude change and the role of the Lean attitude in shaping a culture of continuous improvement, taking into account both internal factors and the elements of the Lean culture such as values, leadership, people, processes and cooperation.

References

1. Abu, F., Gholami, H., Mat Saman, M.Z., Zakuan, Streimikiene, D. (2019). The implementation of lean manufacturing in the furniture industry: A review and analysis on the motives, barriers, challenges, and the applications. *Journal of Cleaner Production*, *234*, 660-680. https://doi.org/10.1016/j.jclepro.2019.06.279
2. Adam, M., Hofbauer, M., Stehling, M. (2021). Effectiveness of a lean simulation training: challenges, measures and recommendations. *Production Planning Control*, *32*(6), 443-453. https://doi.org/10.1080/09537287.2020.1742375
3. Adhikara, A., Rahmawati, W., Musaida, M. (2022). Work Culture, Workload, and Job Satisfaction Intervening a Public Hospital Nurses' Performance. *Interdisciplinary Social Studies*, 1341-1354. https://iss.internationaljournallabs.com/index.php/iss
4. Afrifa Jnr, S., Fianko, S.K., Amoah, N., Dzogbewu, T.C. (2022). The Effect of Organizational Culture on Employee Work Engagement in a Higher Education Institution. *Organizational Cultures: An International Journal*, *22*(2), 89-104. https://doi.org/10.18848/2327-8013/CGP/v22i02/89-104
5. Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, *50*(2), 179-211.
6. Akther, S., Rahman, M.S. (2022). Investigating training effectiveness of public and private banks employees in this digital age: An empirical study. *International Journal of Manpower*, *43*(2), 542-568. https://doi.org/10.1108/IJM-04-2021-0240
7. Antony, J. (2014). Readiness factors for the Lean Six Sigma journey in the higher education sector. *International Journal of Productivity and Performance Management*, *63*(2), 257-264. https://doi.org/10.1108/IJPPM-04-2013-0077
8. Antony, J., Krishan, N., Cullen, D., Kumar, M. (2012). Lean Six Sigma for higher education institutions (HEIs). *International Journal of Productivity and Performance Management*, *61*(8), 940-948. https://doi.org/10.1108/17410401211277165
9. Arumugam, V., Antony, J., Douglas, A. (2012). Observation: a Lean tool for improving the effectiveness of Lean Six Sigma. *The TQM Journal*, *24*(3), 275-287. https://doi.org/10.1108/17542731211226781

10. Atkinson, P. (2010). Lean is a cultural issue. *Management Services*, *54*(2), 35-41. https://citeseerx.ist.psu.edu/document?repid=rep1,type=pdf,doi=1ec394ebfb8cbdf2d8ebf2b9c17beb51d8fb9f3e#page=35
11. Babbie, R.E. (2013). *Podstawy badań społecznych*. PWN.
12. Bakanauskas, A.P., Kondrotienė, E., Puksas, A. (2020). The Theoretical Aspects of Attitude Formation Factors and Their Impact on Health Behaviour. *Management of Organizations: Systematic Research*, *83*(1), 15-36. https://doi.org/10.1515/mosr-2020-0002
13. Ballé, M. (2005). Lean Attitude. *IEE Manufacturing Engineer*, *April/May*, 14-19.
14. Ballé, M., Jones, D., Chaize, J., Fiume, O. (2019). *Strategia Lean: Kultura uczenia się kluczem do budowania przewagi konkurencyjnej*. MT Biznes. https://integro.bs.katowice.pl/site/recorddetail/0033005330532
15. Balzer, W.K. (2020). *Lean Higher Education*. Productivity Press. https://doi.org/10.4324/9781351216944
16. Balzer, W.K., Francis, D.E., Krehbiel, T.C., Shea, N. (2016). A review and perspective on Lean in higher education. *Quality Assurance in Education*, *24*(4), 442-462. https://doi.org/10.1108/QAE-03-2015-0011
17. Beale, J.R. (2008). *Understanding the influences on employee motivation for Lean: An individual-level analysis*. https://orca.cardiff.ac.uk/id/eprint/55797/
18. Boomaars, C., Yorks, L., Shetty, R. (2018). Employee learning motives, perceived learning opportunities and employability activities. *Journal of Workplace Learning*, *30*(5), 335-350. https://doi.org/10.1108/JWL-01-2018-0020
19. Bortolotti, T., Boscari, S., Danese, P. (2015). Successful lean implementation: Organizational culture and soft lean practices. *International Journal of Production Economics*, *160*, 182-201. https://doi.org/10.1016/j.ijpe.2014.10.013
20. Bugdol, M. (2011). *Zarządzanie pracownikami-klientami wewnętrznymi organizacjach projakościowych*. Difin.
21. Cacioppo, J.T., Petty, R.E., Crites, S.L., Jr. (1994). Attitude change. *Encyklopedia of Human Behavior*, *1*. https://www.researchgate.net/profile/john-cacioppo/publication/267026976_attitude_change/links/54414ca70cf2e6f0c0f60d61/attitude-change.pdf
22. Cano, M., Moyes, D., Kobi, A (2016). A framework for implementing Lean operations management in the higher education sector. *Toulon-Verona Conference "Excellence in Services"*.
23. Charmaz, K. (2009). *Teoria ugruntowana: praktyczny przewodnik po analizie jakościowej*. PWN.
24. Chen, Q.F., Leng, F.Y., Ge, F.J., Wang, W.D., Li, C.B., Sun, L.Z. (2020). Effectiveness of virtual reality in nursing education: meta-analysis. *Journal of Medical Internet Research*, *22*(9). https://doi.org/10.2196/18290
25. Creswell, W.J. (2013). *Projektowanie badań naukowych. Metody jakościowe, ilościowe i mieszane.* Wydawnictwo Uniwersytetu Jagiellońskiego.

26. Dinis-Carvalho, J. (2021). The role of lean training in lean implementation. *Production Planning, Control*, *32*(6), 441-442. https://doi.org/10.1080/09537287.2020.1742376
27. Douglas, J., Antony, J., Douglas, A. (2015). Waste identification and elimination in HEIs: the role of Lean thinking. *International Journal of Quality, Reliability Management*, *32*(9), 970-981. https://doi.org/10.1108/IJQRM-10-2014-0160
28. Dragomir, C., Surugiu, F. (2013). *Implementing lean in a higher education university. XIII(18), Article 279-282*. Constanta, Romania: Constanta Maritime University: https://www.researchgate.net/profile/cristina-dragomir/publication/249007449_ implementing_lean_in_a_higher_education_university/links/5e7b9f4a458515efa0a67940/ implementing-lean-in-a-higher-education-university
29. Duggan, J., Cormican, K., McDermott, O. (2023). Lean implementation: analysis of individual-level factors in a biopharmaceutical organisation. *International Journal of Lean Six Sigma*, *14*(2), 309-334. https://doi.org/10.1108/IJLSS-10-2021-0184
30. Eagly, A.H., Chaiken, S. (1998). Attitude Structure and Function. *The Handbook of Social Psychology*, 269-323. https://books.google.pl/books?hl=pl,lr=,id=-4InWCsra7IC,oi=fnd, pg=PA269,dq=defining+attitude+and+attitude+theory,ots=hclH-RYrv9,sig= SqGOBVaR8WN488YRmnUkswMuelY,redir_esc=y#v=onepage,q=defining%20attitude %20and%20attitude%20theory,f=false
31. EL Hajjar, S.T., Alkhanaizi, M.S. (2018). Exploring the Factors That Affect Employee Training Effectiveness: A Case Study in Bahrain. *Sage Open*, *8*(2), Article 2158244018783033. https://doi.org/10.1177/2158244018783033
32. Emiliani, B. (2015). *Lean University. A Guide to Renewal and Prosperity*. Franz The CLBM, LLC, Wethersfield, Conn.
33. Emiliani, M.L. (1998). Lean behaviors. *Management Decision*, *36*(9), 615-631. https://doi.org/10.1108/00251749810239504
34. Grudowski, P., Wiśniewska, M.Z. (2019). Lean Management in Higher Education Institutions. How to Begin? *Scientific Papers of Silesian University of Technology. Organization and Management Series*, *137*, 49-61. https://doi.org/10.29119/1641-3466.2019.137.4
35. Hines, P., Lethbridge, S. (2010). New Development: Creating a Lean University. *Public Money, Management*, *28*(1), 53-56. https://doi.org/10.1111/j.1467-9302.2008.00619.x
36. Kaiser, G., Presmeg, N. (2019). *Compendium for early career researchers in mathematics education*. Hamburg: Springer Nature.
37. Karp, L., Lee, I.H. (2000). *Learning-by-Doing and the Choice of Technology: the Role of Patience*. eScholarship, University of California.
38. Kaźmierczak, A.J., Paszkowicz, M.A., Farnicka, M.A. (2023). Postawy niepełnosprawnych pracowników ZPCH wobec osób chorujących psychicznie. Część I: podstawy teoretyczne. *Zeszyty Naukowe Akademii Górnośląskiej, 12*, 82-90. https://doi.org/10.53259/2023.12.07

39. Kim, E.-J., Park, S., Kang, H.-S. (2019). Support, training readiness and learning motivation in determining intention to transfer. *European Journal of Training and Development*, *43*(3/4), 306-321. https://doi.org/10.1108/EJTD-08-2018-0075
40. Kirkpatrick, J., Kirkpatrick, W.K. (2021). *An introduction to the new world Kirkpatrick model*. Kirkpatrick Partners. https://www.kirkpatrickpartners.com/wp-content/uploads/2021/11/introduction-to-the-new-world-kirkpatrick%c2%ae-model-1.pdf
41. Klemm, L., Brost, R., Kurvuilla, A. (2013). University Of Wisconsin-Parkside Human Resources Customer Service Process Improvement. *Journal of Knowledge, Human Resource Management*, *5*(10), 1-19. https://research.ebsco.com/linkprocessor/plink?id=7a578c68-909a-35b7-96f9-60807bbe85dc
42. Kochoian, N., Raemdonck, I., Frenay, M., Zacher, H. (2017). The Role of Age and Occupational Future Time Perspective in Workers' Motivation to Learn. *Vocations and Learning*, *10*(1), 27-45. https://doi.org/10.1007/s12186-016-9160-9
43. Konecki, K. (2000). *Studia z metodologii badań jakościowych. Teoria ugruntowana.* PWN.
44. Latif, M.A., Vang, J. (2021). Top management commitment and lean team members' prosocial voice behaviour. *International Journal of Lean Six Sigma*, *12*(6), 1289-1309. https://doi.org/10.1108/IJLSS-01-2020-0002
45. Liker, K.J., Ross, K. (2018). *Droga Toyoty do doskonałości w usługach: jak rozwijać lean w firmie usługowej*. MT Biznes. https://scholar.google.com/citations?user=1vfhhliaaaaj,hl=pl,oi=sra
46. Liker, J.K. (2018). *Droga Toyoty: 14 zasad zarządzania wiodącej firmy produkcyjnej świata*. MT Biznes.
47. Liker, J.K., Hoseus, M., Kowalczyk, M. (2016). *Kultura Toyoty : serce i dusza filozofii Toyoty*. MT Biznes. https://integro.bs.katowice.pl/32904517429/liker-jeffrey-k/kultura-toyoty?bibFilter=3
48. Lista, A.P., Tortorella, G.L., Bouzon, M., Thürer, M., Jurburg, D. (2022). Soft and hard skills development in lean management trainings. *International Journal of Lean Six Sigma*, *13*(5), 1137-1158. https://doi.org/10.1108/IJLSS-06-2021-0116
49. Lu, J., Laux, C., Antony, J. (2017). Lean Six Sigma leadership in higher education institutions. *International Journal of Productivity and Performance Management*, *66*(5), 638-650. https://doi.org/10.1108/IJPPM-09-2016-0195
50. Maciąg, J., Bugdol, M., Czerski, M. (2022). Lean management and the change of work culture: the case of a Polish university. In: J. Antony, Ch. Laux, M. Maalouf, R. Jayaraman, G. Tortorella, V.Swarnakar (Eds.), *The Trinity of Operational Excellence in Higher Education Institutions (HEIs): Lean, Six Sigma and Lean Six Sigma* (pp. 72-81). Khalifa University.
51. Maciąg, J. (2019). *Lean Culture in Higher Education*. Springer International Publishing.

52. Malik, M., Abdallah, S. (2020). The relationship between organizational attitude and lean practices: an organizational sense-making perspective. *Industrial Management, Data Systems*, *120*(9), 1715-1731. https://doi.org/10.1108/IMDS-09-2019-0460
53. Mann, D. (2014). *Tworzenie kultury Lean*. ProdPublishing.
54. McNamara, P. (2014). Psychological factors affecting the sustainability of 5S lean. *International Journal of Lean Enterprise Research*, *1*(1), 94-111.
55. Merkac-Skok, M. (2013). Some Characteristics that Influence Motivation for Learning in Organisations. *Interdisciplinary Description of Complex Systems: INDECS*, *11*(2), 254-265. https://doi.org/10.7906/indecs.11.2.7
56. Müller, W., Leyer, M. (2024). Lean and job satisfaction: the mediating role of how employees perceive implemented lean methods. *Production Planning , Control*, *35*(4), 335-351. https://doi.org/10.1080/09537287.2022.2080126
57. Oppenheim, A.N. (2004). *Kwestionariusze, wywiady, pomiary postaw*. Zysk i S-ka.
58. Orpen, C. (1999). The impact of self-efficacy on the effectiveness of employee training. *Journal of Workplace Learning*, *11*(4), 119-122. https://doi.org/10.1108/13665629910276034
59. Pilati, R., Borges, J. (2012). Training Effectiveness: Transfer Strategies, Perception of Support and Worker Commitment as Predictors. *Revista De Psicología Del Trabajo Y De Las Organizaciones*, *28*(1), 25-35. https://doi.org/10.5093/tr2012a3
60. Radnor, Z., Bucci, G. (2011). *Analysis of lean implementation in UK business schools and universities*. Association of Business Schools.
61. Rowley, J. (2002). Using case studies in research. *Management Research News*, *25*(1), 16-27. https://doi.org/10.1108/01409170210782990
62. Ryu, G., Moon, S.-G. (2019). The effect of actual workplace learning on job satisfaction and organizational commitment. *Journal of Workplace Learning*, *31*(8), 481-497. https://doi.org/10.1108/JWL-05-2019-0061
63. Sahinidis, A.G., Bouris, J. (2008). Employee perceived training effectiveness relationship to employee attitudes. *Journal of European Industrial Training*, *32*(1), 63-76. https://doi.org/10.1108/03090590810846575
64. Sinha, T., Allan, R.R. (Eds.) (2013). *Core training and staff motivation: an assessment of improvement initiatives in HE; and lean*. University of Strathclyde.
65. Thirkell, E., Ashman, I. (2014). Lean towards learning: connecting Lean Thinking and human resource management in UK higher education. *The International Journal of Human Resource Management*, *25*(21), 2957-2977. https://doi.org/10.1080/09585192.2014.948901
66. Torraco, R.J. (2005). Writing Integrative Literature Reviews: Guidelines and Examples. *Human Resource Development Review*, *4*(3), 356-367. https://doi.org/10.1177/1534484305278283

67. van Assen, M.F. (2018). Exploring the impact of higher management's leadership styles on Lean management. *Total Quality Management, Business Excellence*, *29*(11-12), 1312-1341. https://doi.org/10.1080/14783363.2016.1254543
68. van Dun, D., Wilderom, C.P.M. (2015). Governing Highly Performing Lean Team Behaviors: A Mixed-Methods Longitudinal Study. *Academy of Management Proceedings*, *1*, 17407. https://doi.org/10.5465/ambpp.2015.127
69. Wańczyk-Welc, A. (2024). *Pojęcie postawy*. Instytut Badań Edukacyjnych. https://open.icm.edu.pl/handle/123456789/25067
70. Wojciszke, B., Grzyb, T. (2024). *Psychologia społeczna. Wydanie drugie zaktualizowane*. https://share.swps.edu.pl/handle/swps/703
71. Womack, P.J., Jones, T.D., Roos, D. (2000). *The Machine that Changed the World.* Rawson Associates.
72. Yin, K.R. (2014). *Case study research. Design and Methods*. Sage Publications.
73. Zanchi, M., Colombo, B., Gaiardelli, P. (2024). *The Influence of Learning Styles on the Perception of Lean Implementation Effectiveness by Employees*). Cham: Springer, pp. 209-220, https://doi.org/10.1007/978-3-031-63265-5_16
74. Zimbardo, P.G., Leippe, M.R. (2004). *Psychologia zmiany postaw i wpływu społecznego*. Zysk i S-ka.

Appendix 1

The research questionnaire

	Lean Attitude - dimensions
	Scale: definitely yes, rather yes, I don't think so, rather no, definitely no
	The cognitive dimension
1	I have better relationships with my superiors
2	I have better relationships with my co-workers
3	I focus more on my actions and tasks
4	I avoid unnecessary discussions and comments
5	I am more open to changes
6	I criticise with respect
7	I am not guided by pride, egoism and prejudice
8	I observe my work more carefully
9	I am more humble towards constructive criticism
10	I want to continue to improve my competencies
11	I treat suggestions for change as an opportunity for improvement
12	I have better relationships with my subordinates
	The affective dimension
1	My job satisfaction has increased
2	My willingness to continue working at the University has increased
3	I feel that I have greater opportunities for professional development within the university structures
4	I feel that I have a greater influence on processes
5	I have a chance to go beyond the daily routine and boredom at work, and to mechanically complete assigned tasks
6	I have a greater sense of meaning in my work
7	I have greater motivation to improve
8	I am more aware of my role in the organisation
9	I am ready/willing to express my own opinion
10	I feel more committed to work
11	I feel that I have a distance from my work (attachment to developed ways of working does not prevent me from making changes)
	The behavioural dimension
1	I'd better identify the expectations of my clients
2	In my actions, I take into account the limitations of people and the resources that the university has
3	I map processes and my work
4	I recognise and analyse problems at their source (where they arise)
5	I focus on the causes of problems, not on finding those responsible
6	I distribute work more evenly (I eliminate downtime, excessive workload)
7	I identify sources of waste on an ongoing basis
8	I create work standards (procedures, instructions, infographics, manuals, etc.)
9	I manage the risk in my work and activities
10	I always stop my work and contact my supervisor/co-worker if I see that problems appear that may result in errors
11	I regularly monitor processes using various metrics (e.g. number of errors)
12	I communicate more effectively with co-workers, especially along the process
13	I analyse how changes affect the work of others
14	I adapt Lean techniques and tools to the specifics of the problems
15	I submit ideas for process improvement
16	I use the knowledge and experience gained during training to improve work
17	I maintain the introduced changes
18	I independently deepen my knowledge in the field of improvement
19	I share my knowledge and experience in improving processes
20	I make decisions based on data and facts
21	I ask why?

	Barriers
	Scale: very important, important, it's hard to say, unimportant, very unimportant
1	Lack of common knowledge among employees about Lean and other improvement methods
2	Lack of common knowledge among managers about Lean and other improvement methods
3	Employee reluctance to change
4	Managers' reluctance to change
5	Lack of commitment from top management
6	Lack of commitment from direct superiors
7	Lack of support in the change process from Lean experts
8	Existing organisational structure
9	Excessive bureaucracy
10	Inadequate digitisation of documentation
11	Incorrectly implemented IT systems/solutions
12	Poor communication
13	Lack of a motivational system focused on supporting change
14	Low salaries
15	Too many distributed databases
	The CI projects - Did you do any CI projects after the training?
	No
	I would like to, but I don't have such possibilities
	I am planning to implement an improvement project soon (this is a realistic plan)
	Yes, I am currently working on my first project
	Yes, at least one project has already been implemented
	The Lean methods and tools
	Which Lean techniques and tools do you use in your daily work? Please select
	• Waste audit (7 wastes, TIMWOODS)
	• Flowchart
	• SIPOC
	• RACI
	• Value Stream Mapping
	• Standard Operating Procedure
	• Brainstorming
	• Affinity Diagram
	• Relationship Diagram
	• 5Why's
	• 5W2H
	• Ishikawa Diagram
	• Pareto Method
	• Control Sheet
	• Questionnaire
	• Pick chart
	• A3
	• Kanban
	• Competencies matrix
	• Daily hudles
	• Gemba
	• Visual management tools
	• 5S
	• I don't use any of them
	• Others?
	Motives (open questions)
	Why did you take part in the Lean training at a university (40 hours)?
	Please provide examples of lasting changes in work habits using Lean techniques and tools (every change, even a small one, is important).