UNIVERSITY OF LJUBLJANA
SCHOOL OF ECONOMICS AND BUSINESS

VIKTORIJA STARIĆ

WORKER OUTCOMES IN LEAN IMPLEMENTATION IN SMALL AND MEDIUM-SIZED ENTERPRISES

DOCTORAL DISSERTATION

Ljubljana, 2025

AUTHORSHIP STATEMENT

The undersigned VIKTORIJA STARIĆ, a student at the University of Ljubljana, School of Economics and Business, (hereafter: SEB LU), author of this written final work of studies with the title WORKER OUTCOMES IN LEAN IMPLEMENTATION IN SMALL AND MEDIUM-SIZED ENTERPRISES, prepared under supervision of Assistant Professor KATERINA BOŽIČ and co-supervision of Full Professor BORUT RUSJAN.

D E C L A R E

1. this doctoral dissertation to be based on the results of my own research;
2. the printed form of this doctoral dissertation to be identical to its electronic form;
3. the text of this doctoral dissertation to be language-edited and technically in adherence with the SEB LU's Technical Guidelines for Written Works, which means that I cited and / or quoted works and opinions of other authors in this written final work of studies in accordance with the SEB LU's Technical Guidelines for Written Works;
4. to be aware of the fact that plagiarism (in written or graphical form) is a criminal offence and can be prosecuted in accordance with the Criminal Code of the Republic of Slovenia;
5. to be aware of the consequences a proven plagiarism charge based on this doctoral dissertation could have for my status at the SEB LU in accordance with the relevant SEB LU Rules;
6. to have obtained all the necessary permits to use the data and works of other authors which are (in written or graphical form) referred to in this doctoral dissertation and to have clearly marked them;
7. to have acted in accordance with ethical principles during the preparation of this doctoral dissertation and to have, where necessary, obtained permission of the Ethics Committee;
8. my consent to use the electronic form of this doctoral dissertation for the detection of content similarity with other written works, using similarity detection software that is connected with the SEB LU Study Information System;
9. to transfer to the University of Ljubljana free of charge, non-exclusively, geographically and time-wise unlimited the right of saving this doctoral dissertation in the electronic form, the right of its reproduction, as well as the right of making this doctoral dissertation available to the public on the World Wide Web via the Repository of the University of Ljubljana;
10. my consent to publication of my personal data that are included in this doctoral dissertation and in this declaration, when this doctoral dissertation is published;
11. that I have verified the authenticity of the information derived from the records using artificial intelligence tools.

Ljubljana, June 4th, 2025 Author's signature: _____

ACKNOWLEDGEMENTS

I want to express my sincerest gratitude to my supervisors, Borut Rusjan and Katerina Božič. Thank you for all your valuable insights and encouragement throughout the process. I am very grateful for the effort you put into shaping this dissertation.

I would also like to thank the School of Economics and Business, University of Ljubljana, and the Faculty of Economics and Business, University of Rijeka, for their support in data collection and research. Thank you to my doctoral committee: Prof. Metka Tekavčič, PhD, Prof. Mojca Marc, PhD and Prof. Jasna Prester, PhD.

I am extending my gratitude to my colleagues from the University of Rijeka: my mentor, prof. Lara Jelenc, and colleagues, dr. sc. Matia Torbarina, dr.sc. Nina Grgurić Čop and Iva Zdrilić.

I want to thank the lean companies, especially their lean coordinators, who dedicated their time and gave valuable insights into how lean companies work. Your contribution was crucial for this dissertation to come to light. I wish you all the best in continuing your lean ventures!

My biggest thank you to my family for their patience and encouragement throughout the process: Sanda, Zlatko, Marina, and my dearest husband, Endi.

SUMMARY

Lean methodology is a powerful tool for business process improvement. It fosters a culture of continuous improvement while eliminating production waste. Its widespread adoption across nations and industries and adaptability to various contexts underscore its potential for SMEs. As SMEs increasingly leverage lean tools to meet customer demands and adapt to shifts in industry quality, the future looks promising for lean implementation in these enterprises.

Efficient lean implementation in SMEs hinges on the active involvement of employees, particularly those on the front line. These workers, with their unique insights into the process, potential issues, and solutions, are the backbone of lean operations. By ensuring their well-being, SMEs can secure the long-term benefits of lean implementation, making them feel valued and integral to the process.

This dissertation offers a comprehensive overview of the factors related to first-line employees (FLEs) and their job resources and demands that affect their health, motivation and job performance. These factors are crucial for the successful implementation of lean in SMEs. We evaluated a wide range of peer-reviewed papers on the role of FLEs in lean implementation, identifying four main themes: cultural change factors, employee characteristics, management involvement, and lean job design. Within each theme, we provide a detailed overview of the FLE-related factors and the associated enablers and barriers that should be considered for successful lean implementation in SMEs. Leaning on this, our research adopts a qualitative interview approach with managers and FLEs in lean SMEs to validate the job demands and resources identified in the literature review. Building on the job demands-resources (JD-R) model, we identify the key lean SME job characteristics (job resources, challenge and hindrance job demands) and confirm them through quantitative SEM analysis, exploring the impact on worker outcomes. This approach allows us to identify lean job demands that should be minimized and lean resources that should be maximized, thereby promoting a positive work environment in SMEs. From an academic perspective, we are adapting the JD-R model to a lean SME environment, enhancing the model and aligning it with this specific context.

Lean in SMEs is simultaneously a resourceful but demanding work environment which has both engaging and exhausting attributes. The insights from this study present building blocks for developing a lean implementation model for SMEs that considers the FLEs' role more comprehensively. Our research outcomes help managers in SMEs facilitate lean acceptance and enhance the likelihood of successful lean implementation.

Keywords: lean methodology, small and medium-sized enterprises, first-line employees, job demands-resources model, worker outcomes

POVZETEK

Metodologija vitke proizvodnje je močno orodje za izboljšanje poslovnih procesov. Spodbuja kulturo nenehnih izboljšav ob odpravljanju proizvodnih izgub. Njena široka vpeljava v različnih državah in panogah ter njena prilagodljivost različnim kontekstom izpostavljata njen potencial v malih in srednje velikih podjetjih (MSP). Mala in srednje velika podjetja v težnji, da bi izpolnila zahteve strank in se prilagodila naraščajočim zahtevam po kakovosti v industriji, vedno bolj izkoriščajo orodja vitke proizvodnje, kar navaja na to, da je prihodnost uvedbe metodologije vitke proizvodnje v teh podjetjih obetavna.

Učinkovito uvajanje vitke proizvodnje v MSP sloni na aktivni vključenosti zaposlenih, zlasti delavcev na najnižji ravni. Ti neposredni delavci s svojim edinstvenim vpogledom v proces, njegove potencialne težave in njihove rešitve predstavljajo hrbtenico vitkega delovanja. Z zagotavljanjem njihovega dobrega počutja si lahko MSP zagotovijo dolgoročne koristi vpeljave vitkega delovanja, tako da zagotovijo, da se ti zaposleni počutijo cenjene in vključene v proces.

Ta disertacija ponuja celovit pregled dejavnikov, povezanih z zaposlenimi v neposredni proizvodnji (First Line Employees - FLE), njihovimi viri in zahtevami, s katerimi se srečujejo pri svojem delu, in ki vplivajo na njihovo zdravje, motivacijo in delovno uspešnost. Ti dejavniki so ključni za uspešno vpeljavo vitke proizvodnje v MSP. Sintetizirali in ovrednotili smo širok nabor znanstvenih del , ki so proučevala vlogo neposrednih proizvodnih delavcev pri uvajanju vitke proizvodnje, pri čemer smo opredelili štiri glavne teme: dejavniki sprememb kulture, značilnosti zaposlenih, vključenost vodstva in oblikovanje vitkega delovnega mesta. Znotraj vsake izmed tem smo oblikovali podroben pregled dejavnikov, povezanih z neposrednimi proizvodnimi delavci, ter z njimi povezanimi podporami in ovirami, ki jih je potrebno upoštevati za uspešno vpeljavo vitke proizvodnje v MSP. Na podlagi tega smo v raziskavi uporabili kvalitativen pristop, v katerem smo izvedli intervjuje z managerji in neposrednimi proizvodnimi delavci v vitkih MSP, da bi potrdili vire in zahteve pri delu, ki smo jih ugotovili na podlagi pregleda literature. Gradili smo na modelu virov in zahtev pri delu (Job Demands-Resources model - JD-R) ter ugotovili ključne značilnosti dela za MSP z vpeljano vitko proizvodnjo (viri pri delu in zahteve pri delu, ki predstavljajo bodisi izziv bodisi oviro). Ugotovljene vire in zahteve pri delu smo potrdili s pomočjo kvantitativne analize modeliranja strukturnih enačb (Structural Equation Modelling – SEM), pri čemer smo raziskovali vpliv na z delavci povezane rezultate. Ta pristop nam omogoča, da prepoznamo zahteve pri delu v vitki proizvodnji, katerih negativni vpliv je potrebno čim bolj zmanjšati, in vire pri delu v vitki proizvodnji, katerih pozitiven vpliv je potrebno povečati, s čimer spodbujamo pozitivno delovno okolje v MSP. Z akademskega vidika model JD-R prilagodimo okolju MSP z vpeljano vitko proizvodnjo, s tem model nadgradimo in ga uskladimo s specifičnim kontekstom.

Vitko delovanje v MSP je hkrati vspodbudno, a tudi zahtevno delovno okolje, ki ima tako angažirajoče kot izčrpavajoče lastnosti. Spoznanja iz te študije predstavljajo gradnike za razvoj modela vpeljave vitke proizvodnje v MSP, ki bolj celovito upošteva vlogo neposrednih proizvodnih delavcev. Rezultati naših raziskav pomagajo managerjem v malih in srednje velikih podjetjih olajšati sprejemanje vitkega delovanja in povečati verjetnost uspešne vpeljave vitke proizvodnje.

Ključne besede: vitka proizvodnja, mala in srednje velika podjetja, neposredni proizvodni delavci, model virov in zahtev pri delu, z delavci povezani rezultati

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

CJD - challenge job demands

COR - conservation of resources theory

CSFs - critical success factors

e.g. - exempli gratia, for example

ERI model - Effort Rewards Imbalance model

ERP - enterprise resource planning

etc. - et cetera, and other similar things

FLEs - first-line employees

GMSI - Gothenburg Manager Stress Inventory

HJD - hindrance job demands

HR - human resources

HRM - human resource management

JC - job characteristics

JD - job demands

JD-C model - Job Demands Control model

JD-R model - Job Demands-Resources model

JIT - just in time

JR - job resources

KPI - key performance indicators

LEs - large enterprises

MO - motivational outcomes

OEE - overall equipment effectiveness

OLBI - Oldenburg Burnout Inventory

RQs - research questions

SEM - structural equation modelling

SLP - soft lean practices

SMED - single-minute exchange of die

SMEs - small and medium-sized enterprises

TPM - total productive maintenance

TQM - total quality management

VSM - value stream mapping

INTRODUCTION

Lean methodology (also known as lean management, lean production, lean philosophy, and similar) is a management tool that maximises customer value while reducing waste in an organisation. The concept of lean can be traced to the Japanese automotive manufacturer Toyota and has since been adopted in diverse industries – textile (Abbass Shah & Hussain, 2016), food (Aragón & Ros-McDonnell, 2015), healthcare (Anuar et al., 2019), and various services (Cuatrecasas, 2004), among others. Lean may be applied to labour- and technology-intensive industries (Bhamu & Singh Sangwan, 2014). It is also understood differently across literature and practice - some think of lean as only a set of tools to be implemented (Chaudhary et al., 2020; Chowdary & George, 2011), while others see it as a complex system containing both social and technical aspects (Bruce et al., 2011; Pearce & Pons, 2019; Stone, 2012). The lean methodology can be viewed as a technical tool or a management philosophy. As a technical tool, it consists of practices contributing to waste reduction in an organisation, production time reduction, inventory reduction, etc. However, as a philosophy, lean focuses on job changes to give employees greater responsibility, expecting their input in continuous improvement (Womack et al., 1990). In lean literature, there is a greater emphasis on technical aspects of lean rather than social ones, but both are equally important in developing long-term lean sustainability (Bhamu & Singh Sangwan, 2014; Danese et al., 2018; Hines et al., 2004; McMackin & Flood, 2019; Shah & Ward, 2007).

Different tools and techniques can be used in lean depending on the context of a company. The applicability of tools and methods depends on the production process, technical-technological development, business and industry in which it is used (Abdulmalek et al., 2006; Tyagi et al., 2015). The general goal of lean is to improve product quality, eliminate waste, and reduce costs and production time. There are different benefits of lean: financial benefits (decreasing costs), customer benefits (understanding their needs), quality benefits (less error), employee benefits (empowered workers) and knowledge benefits (understanding one's process and the whole supply chain) (Melton, 2005). Organisations that successfully implement lean programs face different cultural changes, such as higher institutional collectivism, higher future and humane orientation and lower assertiveness (Bortolotti et al., 2015). Lean success is achieved when a company achieves strategic, operational and performance improvements that are sustainable in the long run (Scherrer-Rathje et al., 2009). Companies can expect financial, customer/market improvements, process, people and future improvements (e.g. development of new technology) when they have successfully implemented lean (Bhasin, 2008).

Many studies on the lean methodology do not focus on company size (Bhasin & Burcher, 2006; Handel, 2014), or they focus solely on large enterprises (LEs) rather than small and medium enterprises (SMEs) (Handel, 2014). However, during the past few years, research has increasingly focused on lean in SMEs (Alefari et al., 2020; Alkhoraif & McLaughlin, 2018a; Arumugam et al., 2020; Belhadi et al., 2016; Caldera et al., 2019). Nonetheless, lean

in SMEs is still identified as a research gap (Belhadi et al., 2018; Ciszewski & Wyrwicka, 2020; Hu et al., 2015; Koloszar, 2018; Pereira & Tortorella, 2018; Valente et al., 2019). Lean methodology is relevant for SMEs since it brings benefits to company performance (Abreu-Ledón et al., 2018; Belhadi & Touriki, 2016; Marin-Garcia & Bonavia, 2015; Valente et al., 2019; Yadav, Jain, Mittal, Panwar, & Lyons, 2019b). However, SMEs are less likely to implement lean compared to LEs (Shah & Ward, 2003), mainly due to the specific challenges and constraints they face, such as financial (Achanga et al., 2006; Caloghirou et al., 2004), time, cultural (Caldera et al., 2019), and technical constraints (Narula, 2004). Lack of commitment from managers, their leadership and the resources needed for implementation are key barriers; and poor communication across levels and dissemination of knowledge of lean benefits are main hindrances that prevent higher implementation of lean among SMEs (Shrimali & Soni, 2017; Yadav, Jain, Mittal, Panwar, & Sharma, 2019; Zhou, 2016). Firm size moderates relationships in lean management. Differences also exist in employee commitment and performance management, and SMEs are more flexible when it comes to responding to customer demands (Malik & Abdallah, 2020; Saridakis et al., 2013; Siegel et al., 2019; Taylor & Taylor, 2014; Yadav, Jain, Mittal, Panwar, & Sharma, 2019). Other enabling factors also make the use of lean easier in SMEs than in LEs: unique business, easier communication across levels, flexible production systems, and SME leadership (Alkhoraif et al., 2019; Hu et al., 2015). Still, being only marginally familiar with lean, SMEs often fear the implementation costs and subsequent benefits (Achanga et al., 2006; Bhamu & Singh Sangwan, 2014; Buehlmann & Fricke, 2016). Research shows that SMEs implement a narrower range of lean tools than LEs do (for instance, only 29% of the sample of firms in Antosz and Stadnicka's (2017) study were SMEs that mainly implemented 5S). SMEs are more selective in choosing and implementing lean practices, focusing on inexpensive and simple ones (Hu et al., 2015). Rose et al. (2011) divided lean practices into three groups: (1) independent of the firm size, (2) related to firm size and potentially more difficult for SMEs to implement, and (3) implemented in stages (e.g. 5S, total productive maintenance). They propose 17 feasible lean practices for SMEs based on least investment needed, feasible to apply in SMEs and which are recommended by researchers. Aligned with this research, it was discovered that SMEs most often choose 5S/6S, visual management, Fishbone diagram, Kanban, Kaizen, level scheduling, small lot sizing, single-minute exchange of die (SMED) and standard work (Alkhoraif et al., 2019; Antosz & Stadnicka, 2017; Zhou, 2016). Earlier research concerning lean focused on a comprehensive adoption of lean (Rose et al., 2011), but later recommendations suggest implementing lean in small steps, with feasible lean elements that do not require big initial financial investments (Majava & Ojanperä, 2017).

One of the key components of the lean idea is encouraging employee participation (Hu et al., 2015). Human resources, namely employee involvement, represent one of the crucial factors impacting lean implementation in businesses (Womack & Jones, 2003) - the philosophy of lean lies, among others, in the continuous improvement principle. The entire organisation must be focused on supporting process optimisations and waste removal, and a

system-wide continuous improvement mindset must be established (Hu et al., 2015). Besides company-organized initiatives, this principle also relies on the worker's ability to identify waste in their workplace or find better ways of doing their job. However, employees must also be willing to share their findings, which implies a certain level of commitment to the organisation. Implementing lean is not easy for anyone involved since it represents a radical change in an organisation. Also, most of the literature looks at lean as a socio-technical system. It can be concluded that lean also deals with the organisation of human work and its impacts on the workforce.

Some researchers claim that "lean is mean", as its introduction may negatively affect skill utilisation, autonomy and workers' decision-making engagement in certain lean groups (Parker, 2003). Reasons for this include simplifying procedures (especially in assembly lines) and emphasis on standardisation in lean companies (Bouville & Alis, 2014; Parker, 2003). Increases in workplace intensity related to lean implementation give rise to stress in workers, and their health at work deteriorates (Anderson-Connolly et al., 2002; Bouville & Alis, 2014). Lean entails ambiguous, less structured job designs (Stone, 2012) and changes in the way of doing business, which causes employee resistance (Antosz & Stadnicka, 2017) and health issues (Brown & O'Rourke, 2007). This human aspect is one of the elements of criticism of the lean approach (Hines et al., 2004). Still, it is possible to develop a lean practice that positively affects worker innovative behaviour (Atatsi et al., 2019) through participation in lean thinking (Abdul Hamid et al., 2020). It also affects health (e.g. lean leadership may influence the positive perception of health among workers, Bäckström & Ingelsson, 2016). Some researchers also found that the positive and negative effects of lean cancel each other out, which means that worker health is not affected (Hasle, 2014). The relationship between lean, employee health and well-being, and the working environment remains unclear. Contradictory findings exist on the impact of lean on employees. The current literature shows positive and negative effects on workers, although the negative ones, such as workers' experiencing health problems, still prevail (Hasle et al., 2012). Some research provides an answer somewhere in the middle – a grey area where authors admit that both good and bad sides to lean exist from the standpoint of employees (de Treville & Antonakis, 2006; Hasle, 2009), claiming mixed effects of lean dependent on management style and the implementation approach (Koukoulaki, 2014).

To explain these mixed findings, some authors developed a model of job design under lean manufacturing, which considers both positive and negative findings of lean influence on employee outcomes. They separated lean demands (production pace, monitoring) from lean resources (teamwork, autonomy, skill utilisation). The lean demands damage employee well-being, while the lean resources have a more positive impact (Cullinane et al., 2014). However, lean demands also may have a motivating role. Therefore, it was found that lean has both positive and negative effects on employees, depending on the type of tool or activity implemented. The question is how to efficiently deploy positive and counter-act negative

effects of lean so that worker well-being is maximised while achieving lean benefits for the company on the organisational level.

Only a few works in the literature deal with first-line workers in lean particularly (Hung et al., 2015; Roberts, 2014; Robinson & Schroeder, 2009; M. Smith et al., 2018; Sterling & Boxall, 2013). Participation of first-line workers is important in lean implementation, particularly in local changes and operational improvements, since they can implement their tacit knowledge in these areas (Dombrowski et al., 2012). Also, commitment, belief, work method, and communication impact the perceived lean success of shop floor workers, with implications of gender differences. However, the relationship between organisational culture and lean production practices is more intricate at the managerial level (Losonci et al., 2017). The first-line workers' perceptions of lean depend on internal factors (commitment, belief, work methods) and external factors (new working methods - changes, communication, work content). Contextual factors which may cause different perceptions may be characteristics of the processes or work method, national and organisational context, and gender. Since first-line employees are sceptical about the benefits of lean, they are unwilling to provide information concerning their work area, which may impede further research and findings on this topic (Achanga et al., 2006). Moreover, most of the employees in SMEs have low skill levels, and managers might avoid giving them autonomy for this reason (Esser & Olsen, 2012).

Specifically in SMEs, people, soft issues, skills and expertise, employee involvement, and similar factors connected to employees are mentioned as critical success factors (CSFs) (Achanga et al., 2006; Qing Hu et al., 2015; Lande et al., 2016; Pereira & Tortorella, 2018; Yadav, Jain, Mittal, Panwar, & Sharma, 2019, Alhuraish et al., 2017). Exploring the human factor for successful lean implementation has been identified as a void in the lean literature in the SME context (Bamber et al., 2014; Brännmark & Holden, 2013; Che Mamat et al., 2014; Ramadas & Satish, 2018). Workers are crucial in lean since they offer suggestions, participate in decision-making and problem-solving (Forza, 1996), take high responsibility for their area of work (Antomarioni et al., 2020) and become multi-skilled (Womack et al., 1990). Under the term "workers," we assume employees are directly involved in producing products or providing services. In the literature, they may be presented as “blue-collar workers” (Seppälä & Klemola, 2004), “first-line workers” (Martinez & Janečka, 2017) or similar terms. There have been calls from literature to explore further the relationship between lean and workers, for example, the relationship between mental workload and lean implementation (Widyanti & Larutama, 2016). Literature also calls for further research on worker's environmental conditions (physical and psychological), which influence their behavioural outcome in the lean environment (Gaiardelli et al., 2019). Genaidy & Karwowski (2003) claim that a quantitative assessment of job demands and resources in a lean environment is absent in the literature. They state that this is vital for assessing the best performance practices for optimal results and maintaining worker well-being. Some have

answered this call for research, but in the general context, they do not focus on SMEs (Cullinane et al., 2014; Huo & Boxall, 2018).

Lean context, lean implementation and practice impact the working environment, ultimately affecting employee health and well-being (Hasle et al., 2012). Lean companies want to provide working environments where workers are motivated and contribute to continuous improvement with their ideas and insights. Workers provide valuable insights into lean since they work closest to the production line and use lean tools the most. First-line workers have very task-specific knowledge (V. Wickramasinghe & Wickramasinghe, 2016). Contributing with helpful insight, workers ensure production flow with minimal errors, which is the ultimate goal of lean. For managers and companies to enable such participation, they must ensure an adequate work environment where workers feel engaged and thus motivated, and not exhausted. Critics of lean mention significant intensification of work instead of higher involvement of workers (Carter et al., 2013; McMackin & Flood, 2019; Mehri, 2006; Stewart et al., 2009). Adequately shaping the job design aims to ensure engagement and counteract the negative impacts of using lean tools and techniques.

Engaged workers are the primary determinant of lean success (Angelis et al., 2011), but only if lean is appropriately executed in companies. Excessive leanness may diminish employee engagement (de Treville & Antonakis, 2006). Many employees reluctantly engage in lean activities such as problem-solving, multiskilling or decision-making (Vidal, 2007). However, they are expected to engage in continuous improvements with their ideas and insights. The reluctance may be avoided by forming a team-based work structure (Bayo-Moriones et al., 2008) or enhancing training, mentoring and coaching (Alefari et al., 2017). However, workers must learn to use lean tools and techniques besides regular work tasks. This increases job complexity and intensifies their work, ultimately impacting worker well-being. First-line manager support has a mediating role in diminishing exhaustion and buffering the effects of work intensification on well-being (Huo et al., 2019). Such support may be provided through clear feedback on performance (de Treville & Antonakis, 2006).

Lean production requires high degrees of responsibility of first-line workers for their respective work areas (Åhlström & Karlsson, 1996; Bendell, 2005). Workers are expected to be multi-skilled and flexible (Forza, 1996) and have the ability to work in teams. The lean culture includes proactive work, co-worker support, and regular and efficient contributions. Dahlgaard & Dahlgaard-Park (2006, p. 572) state, "The success of the system depends on everybody's participation". Therefore, the high-quality job performance of first-line workers is essential to sustaining lean since their high job involvement (V. Wickramasinghe & Wickramasinghe, 2016) and participation are central to lean (Forza, 1996). It is essential to understand how first-line employees get accustomed to lean tools and techniques which reshape their work tasks (G. L. D. Wickramasinghe & Wickramasinghe, 2016) to understand worker job performance (Losonci et al., 2011). To perform effectively, workers must have skill variety, responsible autonomy and work facilitation (Angelis et al., 2011), but management must also offer adequate pay or remuneration (V. Wickramasinghe &

Wickramasinghe, 2016). Worker performance is the outcome of workforce management and may contribute to firm performance (Appelbaum et al., 2000; Boxall & Macky, 2007).

There are many frameworks in the literature trying to describe the phases of lean in a company. Mostafa et al. (2013) extensively reviewed available roadmaps, conceptual/implementation frameworks, and descriptive and assessment checklist initiatives for lean implementation. They structured a new framework consisting of four implementation phases: the conceptual phase, implementation design phase, implementation and evaluation phase and complete lean transformation. In this research, we will focus on the companies in the final phase of this framework - complete lean transformation. These companies are aware of lean, have introduced it in their operations, and have conducted the initial business analysis, pilot project, and similar activities related to introducing the methodology. In this research, implementation does not imply the introduction of lean but rather the use of lean in a company. Each phase of lean requires different employee demands (Losonci et al., 2011). Gaiardelli et al. (2019) overviewed the role of human factors in lean management, looking at lean through phases and discovering that human factors determine the company's short- and long-term performance. However, employee behaviour outcomes (conditioned by the physical work environment and job characteristics) influence company performance in the long term, so we will focus on the final stage of the Mostafa et al. (2013) framework.

This study will be the first to explore exhaustion, engagement, and job performance in lean SMEs, presenting three worker outcomes connected to well-being. Therefore, in the continuation of this paper, when we mention “worker outcomes”, we are implying the exploration of exhaustion, engagement and job performance. These constructs have already been explored in lean literature (Cullinane et al., 2014; Huo & Boxall, 2018) but not in the context of SMEs. This context is vital to understand because the amount of literature on lean in SMEs is growing, as is the exploration of lean in SMEs (Belhadi et al., 2018). However, the research lacks focus on worker well-being (Bhamu & Singh Sangwan, 2014), specifically focusing on first-line workers. This research will offer valuable and practical insights into the appropriate design of the lean process in SMEs that allows for engaged workers. Furthermore, exploring job characteristics of lean in SMEs and their impact on worker well-being will contribute to the ongoing debate on the positive and adverse consequences of lean on workers – specifically, their engagement, exhaustion and job performance (Hasle et al., 2012; Landsbergis, Cahill, & Schnall et al., 1999; Longoni et al., 2013; Parker, 2003; Saurin & Ferreira, 2009).

We rely on the job demands-resources model (JD-R), where employees face job demands from employers and use the provided resources to reduce negative job demand impacts. These demands represent any aspects of the job where physical or mental efforts are required, and they bring specific physiological and psychological costs (Demerouti et al., 2001). These may be problem-solving demands (Huo & Boxall, 2018), work intensification, role overload, work or production pressure (Schaufeli & Taris, 2014), which might lead to

exhaustion (Beraldin et al., 2019; Demerouti et al., 2001; Huo & Boxall, 2018). The other part of the model consists of job resources, any job aspects that reduce the costs job demands bring, help in achieving work goals or inspire personal growth and progress (Demerouti et al., 2001). Some job resources include autonomy (Dijkhuizen et al., 2016), social support (either supervisors or co-workers) (Korunka et al., 2009), performance feedback (Schaufeli & Taris, 2014), and task identity. This dissertation will identify job demands and resources in the context of lean use in SMEs. Although some attempts have been made to apply the JD-R model to lean context (Beraldin et al., 2019; Cullinane et al., 2014; Huo & Boxall, 2017b, 2018), none specifically focus on SMEs. Thus, more research is needed to explain the plausibility of the JD-R model in the lean context of SMEs.

This dissertation focuses on researching the involvement of workers in lean SMEs, building on the job demands-resources (JD-R) model. As the gaps imply, further understanding of the impact of lean use on worker well-being (Bhamu & Singh Sangwan, 2014; Camuffo et al., 2017) in the SME environment is needed (Nawanir et al., 2020). The model - JD-R framework - serves to understand different job characteristics which foster employee well-being (Lesener et al., 2019). It was used in research for identifying antecedents of burnout (Demerouti et al., 2001), improving work and health of workers (Schaufeli & Taris, 2014), or exploring motivational processes (Halbesleben & Bowler, 2007). In this research, we aim to better understand the mechanisms and processes that inhibit and motivate employee engagement, cause exhaustion, and impact job performance in a lean SME context through the JD-R model. Therefore, when we talk about worker outcomes (de Treville & Antonakis, 2006), in this dissertation, they represent work engagement, exhaustion and job performance of workers in lean SMEs, similar to de Treville & Antonakis (2006), where they name »work outcomes« to be three aspects of work they deem appropriate to research (performance, satisfaction, absenteeism).

The core assumption is that employee well-being is affected by job characteristics (namely, job demands and job resources) (Bakker & Demerouti, 2007; Brauchli et al., 2013; Shevchuk et al., 2018). Therefore, this model explores worker well-being by balancing positive and negative job characteristics (Schaufeli & Taris, 2014). Specifically, we explore first-line worker level of engagement in lean SMEs, the level of exhaustion dependent on job demands and the overall impact on job performance.

This study's findings are expected to confirm the applicability of the JD-R model in the lean context in SMEs and upgrade the model based on the specifics of lean SMEs. This will provide additional empirical support for the model and deepen the understanding of the JD-R model. We also aim to provide a further understanding of worker outcomes in lean SMEs and the mechanisms behind the job performance of workers working in lean SMEs. From the practical viewpoint, this alteration of the JD-R model may be used in SMEs as a diagnostic tool to understand the impact of job design on worker outcomes. Moreover, this research will help take a step further from the general discussion of positive or negative

effects of lean on employees, finding the balance between job demands and job resources to create a lean job design in SMEs beneficial to both the organisation and its employees.

This dissertation is organised into five chapters. After introducing the research topic and the research issue, intended contribution, and assumptions, we summarise the existing literature on the importance of first-line employees in lean SMEs specifically. The second chapter identifies job demands and job resources specific to the lean SME context through a literature review and further confirms the findings through interviews in selected case companies. The third chapter uses the identified elements to indicate the applicability of the JD-R model in the lean SME setting. Finally, the overall impact on job performance will be discussed. The final chapter will present a general discussion regarding the dissertation's contribution and theoretical implications.

1 CHAPTER 1: IMPORTANCE OF FIRST-LINE EMPLOYEES IN LEAN IMPLEMENTATION IN SMES: A SYSTEMATIC LITERATURE REVIEW

Increasing market competition and environmental dynamism have forced businesses to focus on implementing efficient improvement programs to meet changing customer needs (Inuwa & Rahim, 2020; Prasanna & Vinodh, 2013). The lean methodology is increasingly being implemented to manage such challenges because it improves firm responsiveness to changing customer demands while simultaneously optimising the underlying operating processes. The lean concept can be traced to the Japanese automotive manufacturer Toyota, which improved its processes to increase efficiency and eliminate waste, creating greater customer value (Womack et al., 1990; Womack & Jones, 1996). The main idea behind lean is the concept of continuous improvement of products and processes as well as elimination or reduction of activities that do not add value for the customer—so-called waste (overproduction, waiting, excessive inventory, motion, defects, unnecessary transport, and over-processing) (Bhamu & Singh Sangwan, 2014; Gupta & Jain, 2013). Some common goals of lean implementation are a continuous flow of activities, reduced delivery times, improved quality at lower costs, waste elimination, and minimised inventory (Hines et al., 2004). Therefore, if properly managed, lean allows firms to create a competitive advantage via cost reduction, enhanced productivity, high responsiveness to customer demand, and improved quality (Hasle et al., 2012; Womack, 2007).

Although the benefits of lean have been widely proclaimed and published, many firms struggle with lean implementation, especially small- and medium-sized enterprises (SMEs) characterised by scarce resources and complex processes (Dombrowski et al., 2010; Goodyer et al., 2011; Shah & Ward, 2003). Most of the research on lean implementation has focused on large firms (Belhadi et al., 2019), limiting the transfer of the findings to SMEs because of their specific characteristics and needs (Dombrowski et al., 2010; Rymaszewska, 2014). Lean implementation in SMEs is often considered a project involving the introduction of

technical tools supported by external expertise (Achanga et al., 2006; Kumar et al., 2006). The predominant focus on the technical application of various tools with limited consideration of employees has provoked many lean failures (Huber & Brown, 1991; Womack, 2007). Fulfilling the guiding principles of lean requires continuous learning and dynamic adaptation of employee operations (Dombrowski et al., 2012; Gambatese et al., 2017; Hasle et al., 2012). The shift from control-focused work systems toward lean has had a considerable effect on FLEs (alternatively, shop-floor or "blue-collar" workers) (Boxall & Macky, 2007; Godard, 2004). By "first-line employees," we mean employees who are directly involved in the production of products or the provision of services (Lande et al., 2016; Shokri et al., 2016; Womack & Jones, 2003). They work in a context different from that of managers at higher levels (e.g., different work environments, motivation systems, and responsibilities) (Huber & Brown, 1991), and they are expected to be excited about and committed to adopting lean (Womack et al., 1990). Existing literature reviews have contributed significantly to the understanding of the barriers and enablers of lean methodology in SMEs (Hasle et al., 2012; Hu et al., 2015; Khazanchi et al., 2007; Magnani et al., 2019; Sony & Mekoth, 2019) but have failed to consider comprehensively the lowest hierarchical level, which was previously found crucial (Vidal, 2007). Hence, authors in the field of lean have emphasised the need for a better understanding of FLEs' behavioural aspects alongside the various contextual determinants (Schmidt, 2011; Q. Zhang et al., 2012), especially in the SME context (Campagna et al., 2020; Hu et al., 2015; Losonci et al., 2017; Pearce et al., 2018) in which companies are significantly lagging in lean implementation, besides the great potential (Pech & Vaněček, 2018). However, the existing literature offers anecdotal evidence from studies focusing on employees in SMEs and their role in lean implementation (Hines et al., 2011; Losonci et al., 2011, 2017; Shokri et al., 2016), with the main focus on the identification of critical success factors, readiness to embark on lean applications of human resource practices, and measuring employee performance. Moreover, some studies have partially explored mechanisms for fostering FLEs' motivation, engagement, and involvement in lean initiatives (e.g., Boxall and Macky, 2007; Cullinane et al., 2017), leaving the topic underexplored, vague, and unsystematised. This study answers the existing calls for further clarification of the employee's role in the specific contextual conditions of SMEs to achieve successful lean implementation (Bortolotti et al., 2015; Magnani et al., 2019; Thirkell & Ashman, 2014). Hence, we aim to (a) identify the main themes and factors related to FLEs' role in lean SMEs and (b) determine associated enablers and barriers that can help practising managers facilitate lean acceptance and enhance the likelihood of successful lean implementation. To correctly outline the structure of this field, we intend to extract themes representing groups constructed based on topics of shared meaning related to the role of FLEs in SME lean implementation. We further divide the themes into factors that either positively or negatively impact the FLE role in SME lean implementation. In this analysis, factors act as content subsections of themes. Enablers represent characteristics of identified factors that promote and help FLEs in successfully engaging in SME lean implementation, and barriers represent characteristics of factors that act as obstacles or issues which prohibit adequate involvement of FLEs in successful SME

lean implementation. Therefore, the study will address the following research questions (RQs):

RQ1: What has been researched regarding first-line employees and their roles in lean implementation in SMEs?

RQ2: What are the main themes, factors, and related drivers and barriers of lean implementation in SMEs that emerge concerning the role of first-line employees in lean implementation in SMEs?

The chapter is organised as follows: First, we provide an overview of general literature about lean methodology implementation in SMEs and the importance of FLEs in lean. We then explain the methodology used for our literature review and follow up with a discussion of the findings. Lastly, we identify and discuss limitations and potential future research avenues.

1.1 Background literature

1.1.1 Lean in small- and medium-sized enterprises

For lean to be adequately implemented, the context and industry should be clearly understood since adopting lean is not easy. Some lean implementations may end up in declining profitability or high dependency on buyers in the supply chain (Cox & Chicksand, 2005), while others testify of the financial and other benefits it brings (Zhou, 2016). Implementing lean in SMEs specifically should also bring certain benefits. However, for this implementation to be proper and long-lasting, the context of SMEs should be understood, as well as the differences in implementation as opposed to LEs.

There is no academically established definition of a small and medium-sized business (Curran & Blackburn, 2001; Josefy et al., 2015), but rather it is defined by international institutions, national laws or industry (Berisha & Pula, 2015). Different parameters define it, which are not unified across organisations. These parameters include size and the number of employees, annual turnover, annual sales, and asset value of an organisation… SMEs can be defined both qualitatively and quantitatively. European Commission presents the total headcount as the primary measure of size but adds a financial criterion to understand a company's performance and its position among its competitors. Therefore, in Europe, SMEs are firms with fewer than 250 employees and an annual turnover not exceeding EUR 50 million. They represent 99% of all businesses in the EU, providing two-thirds of employment in the private sector (European Commission, 2021). Qualitatively, SMEs show differences in ownership and management structure, customers and markets they target, systems, processes and procedures, human capital management and culture and behaviours (Supyuenyong et al., 2009).

SMEs have distinctive characteristics that significantly influence the success of lean implementation (Achanga et al., 2006; Shah et al., 2008). Existing literature shows that the main objective for lean implementation in SMEs is the optimization of operation processes, emphasizing waste reduction (inventory, space, and lead and delivery time) (Dora et al., 2014; Grewal, 2008; Hu et al., 2015). Not surprisingly, the lean tools implemented most often in SMEs are value-stream mapping, Kanban, 5S/6S, and visual management (Alkhoraif et al., 2019; Hu et al., 2015).

Although SMEs cannot compete with LEs regarding economies of scale and investments, they compete with them by different metrics. Regarding customer needs, SMEs show greater flexibility and adaptability (Antony et al., 2017), and employees usually form close relationships with customers (Supyuenyong et al., 2009). Performance is also measured through customer satisfaction as the primary metric in SMEs (Supyuenyong et al., 2009; K. Y. Wong & Aspinwall, 2004). This is also important when implementing lean since the methodology ultimately focuses on eliminating waste while retaining customer satisfaction. Therefore, implementing lean will bring benefits to SMEs, such as good customer responsiveness (Spann et al., 1999).

Even though lean is a highly convenient program for implementation in SMEs (Hu et al., 2015), the literature contains much evidence of implementation failures, with failure rates of 60–90% (Secchi & Camuffo, 2019). The required implementation cost and the uncertainty of the subsequent benefits, alongside the high failure rate, limit the commitment and application of lean in SMEs (Achanga et al., 2006; Ping-yu, 2009) compared to large enterprises (Shah & Ward, 2003). Therefore, many comprehensive studies of lean implementation in SMEs have aimed to understand critical barriers that prevent and critical success factors that enable successful lean implementation in SMEs (Hu et al., 2015; Rymaszewska, 2014; Yadav, Jain, Mittal, Panwar, & Sharma, 2019). Leadership and management strategy, organisational culture, education and training, and employee involvement were often listed as critical success factors for successful lean implementation in SMEs (Achanga et al., 2006; Bhamu & Singh Sangwan, 2014; Timans et al., 2012). Hence, some specifics of SMEs act as enablers and barriers to lean implementation. For instance, lack of funding (Panizzolo et al., 2012), underdeveloped processes and quality control systems, lower supply-chain power for just-in-time delivery, poor management supervisory and support (Alkhoraif et al., 2019), and greater demand variability (Dowlatshahi & Taham, 2009) act as barriers. On the other hand, production system flexibility, good communication, long-term commitment to maintaining the business, greater government support, and multiskilled employees (Hu et al., 2015; Rymaszewska, 2014) enable lean implementation in SMEs.

Full lean implementation usually requires substantial investments; thus, a fruitful environment for lean implementation requires economic stability (Costa et al., 2019; Mazanai, 2012). The requirements for upfront projection of implementation costs and related benefits (Achanga et al., 2006), the uncertainty of financial benefits, and the time lag

between the implementation and the financial benefits make lean implementation in SMEs less viable (Zhou, 2016). Therefore, SMEs could consider less sophisticated and inexpensive lean tools, such as 5S, kaizen, value-stream mapping, standardization, and total productive maintenance for internal improvement as steppingstones to lean implementation (Chaplin et al., 2016; Hu et al., 2015; Lee, 2004; Nguyen, 2015). Other more sophisticated lean tools (e.g., level scheduling, small-lot sizing) should be implemented subsequently (and partially according to a firm's specific operating conditions) after the creation of initial internal capacity (Done et al., 2011; Hu et al., 2015; Mathur et al., 2012; Rose et al., 2013).

There are many barriers SMEs face when implementing lean methodology. The barrier factors have been widely explored in the literature, and they include factors such as high inventory, high rejection rate, lack of funds, resources or time, lack of top management commitment or support, but also poor training provided to workers, employee resistance or lack of well-trained staff. A comprehensive list of all the barriers was provided by (Ramadas & Satish, 2018). Acquiring and retaining lean managers who will guide the implementation of sophisticated lean principles with the underpinning human resource management practices is a severe limitation for SMEs (Tortorella et al., 2015). Many governmental agencies and professional associations offer financial and advisory support for lean implementation in SMEs; however, external consultancy can be of limited effectiveness because this kind of intervention usually does not consider contextual factors (Hu et al., 2015; Wu et al., 2014).

Lean operations concepts (e.g., just-in-time, zero inventories, and small-lot production) require collaboration with supply chain partners; however, SMEs might exercise limited negotiating power in influencing suppliers and customers to become involved in their lean endeavours (Dowlatshahi & Taham, 2009; Rymaszewska, 2014). Hence, some authors claim that internal process improvements (e.g., employee involvement and participation) are more suitable for SMEs than external improvements are, requiring the adjustment of the lean principles of just-in-time procurement and distribution in SME settings (Panizzolo et al., 2012; Stamm & Golhar, 1991).

Fewer organisational layers in SMEs facilitate flexibility and promote change, lower bureaucracy, and direct communication between managers and employees, acting as a strong enabling factor (Dowlatshahi & Taham, 2009; Huber & Brown, 1991). However, informality could jeopardise adopting lean practices that rely on process standardization (Timans et al., 2012).

The scope of lean implementation is also essential to understand. Some companies implement lean on the operational level, introducing picked tools to the shop floor. In contrast, others see it as an all-encompassing methodology and implement it strategically, with long-term improvement plans (Hu et al., 2015). Although lean should be considered a long-term investment and viewed holistically (Hines et al., 2004), it is often implemented only on the operational level. The research follows these trends since most papers focus on

the applicability of lean tools and techniques while ignoring the bigger perspective of lean (Van Goubergen et al., 2011). Also, Hu et al., (2015) claim there is a greater focus on lean efficiency in SMEs rather than effectiveness improvement. Implementing lean on an operational level (without thinking strategically) requires fewer resources and investments in time, finances and effort. This route may be a more logical choice for SMEs that, as mentioned, face financial, time and technical challenges. Another reason is the time lag between implementation and financial benefits received from the implementation (Zhou, 2016, p. 201).

Besides (delayed) financial benefits, implementing lean in SMEs has a potentially positive impact on business success, both through improvements in quality and productivity (Dora et al., 2014; Roth & Franchetti, 2010; B. Singh & Sharma, 2009) and through reductions in product cost, inventory, space, and time (for example, lead time, delivery time, changeover time, and throughput time) (Hu et al., 2015).

SMEs have a different owner and management structure, where owners are closely connected to managing (owners are often managers). They are making the critical strategic decisions, also such as implementing lean. Therefore, supportive managers are a critical factor in implementing such a methodology, alongside providing best practices that are efficient and cost-effective (Van Goubergen et al., 2011). As mentioned, SMEs do not have the resources to make large investments, so concerning lean, it is best to focus on tools and methods which require less financial effort but still bring results, such as 5S, quality circle, preventive maintenance and employee involvement (Lee, 2004; White et al., 1999). Some of these (quality circles, for example) could enhance employee participation and organisational involvement (Van Goubergen et al., 2011).

The structural and contextual characteristics of SMEs are different to LEs. A flat structure with few levels allows quick communication between levels, fast decision-making and implementation of management strategies (Yadav, Jain, Mittal, Panwar, & Sharma, 2019). Because of this less complex structure (compared to LEs), the operational planning and control systems are simple, with plenty of informal rules and procedures. Work processes are less standardized and formalized in SMEs, and the operations are less complex, fluid and adaptable (Supyuenyong et al., 2009). This can help when implementing lean methodology, so the processes (and workers) easily adjust to the changes.

Positive aspects of SMEs regarding workers include a small degree of resistance to change and a multi-skilled workforce (Darcy et al., 2014). Individual creativity is encouraged (Saunders et al., 2014). However, because of limited financial resources, workers often lack training and learning opportunities (Tam & Gray, 2016a). In contrast, LEs can offer their workers in-house training and external training programmes (Yadav, Jain, Mittal, Panwar, & Sharma, 2019).

Different organisational structure, job nature and working environment in SMEs change the nature of job resources provided and the demands asked of workers. The difference also exists with the magnitude of various job stressors, as each job stressor differs depending on the company size. The authors Lai et al. (2015) found that job characteristics such as good work relationships, job insecurity and poor career progression, qualitative work overload and poor communication have a more substantial impact on job stress in SMEs than LEs. LE workers experience greater qualitative work overload, poor job autonomy and employee engagement.

1.1.2 Lean and first-line employees

The literature has not agreed on the implications for employees involved in lean implementation in SMEs (Hasle et al., 2012; Hu et al., 2015; Losonci et al., 2011; Pearce et al., 2018; Shokri et al., 2016). Lean demands a high degree of responsibility for employee work (Panizzolo et al., 2012) as well as flexible, multi-skilled employees who can successfully work in teams, continuously improve processes, and actively solve problems (Andersson et al., 2006), allowing employees to work "smarter" instead of "harder" (Womack, 2007). However, some authors (Boyle & Scherrer-Rathje, 2009; Conti et al., 2006; Lewchuk & Robertson, 1996) argued that the inherent characteristics of lean could hinder rather than facilitate employee productivity. Work intensification, increased responsibility and accountability, higher peer pressure, and continuous involvement in the production process may create unfavourable working conditions (Delbridge et al., 1992) and counteract job autonomy, decision-making involvement, upskilling, and active participation in problem-solving activities (M. Parker & Slaughter, 1988; Parker, 2003). SMEs' FLEs are, to a greater extent, overburdened by routine operational activities, reducing their readiness and commitment to long-term improvement (Kumar et al., 2006; Rymaszewska, 2014; Shokri et al., 2016). Moreover, some peculiarities of SMEs, such as job insecurity, poor communication, and lower promotion opportunities, introduce additional challenges for the lean employees (Achanga et al., 2006; AlManei et al., 2017; Hu et al., 2015; Lande et al., 2016). Hence, existing research evidence reports many adverse health (cardiovascular diseases and musculoskeletal disorders) and well-being effects (job stress, monotony, and exhaustion) of FLEs in SMEs (Hasle et al., 2012; Landsbergis et al., 1999; Pearce et al., 2018). However, Delbridge (2005) and Conti and Gill (1998) posited that the potential adverse effects of lean on employees are contingent upon the design and operation of lean production systems. Hence, authors have suggested establishing innovative human-resource management systems that allow the coexistence of high-involvement work and intensive, competing lean practices (e.g., Kramar, 2014; Neirotti, 2020).

Shokri et al. (2016) and Alhuraish et al. (2017) emphasized that "softer" variables of employee behaviour and cultural changes can be essential for lean implementation and require further exploration. Surprisingly, evidence is rare concerning the importance of FLEs' behavioural attitudes in lean applications (Hines et al., 2011; Losonci et al., 2011;

Ramadas & Satish, 2018). One possible reason might be the extensive focus on measuring operational and financial performance instead of on employee behavioural changes. A holistic lean implementation requires developing a supportive cultural environment, which is usually time- and resource-intensive (Hines et al., 2011). Successful lean adoption requires careful implementation planning for the pre-implementation, implementation, and post-implementation phases. For the pre-implementation phase, lean awareness programs should be created to overcome initial resistance, increase trust in lean benefits, and create a long-term commitment to a quality culture, especially among FLEs and their supervisors (Bhamu & Singh Sangwan, 2014; Liker & Wu, 2000). Hence, external training and education programs based on lean principles might create the needed employee readiness and empowerment for the implementation phase (Gunasekaran & Lyu, 1997). The post-implementation phase should ensure continuous improvements after the implementation phase. Thus, high employee satisfaction should be reached through recognition and reward systems, cross-training, and information feedback (AlManei et al., 2017). Therefore, lean adoption requires consideration of various technical, organisational, and social changes (Åhlström & Karlsson, 1996).

Managerial views on lean as a prominent tool for process improvement while neglecting human aspects for sustained change and continuous improvement often result in absolute implementation failure in SMEs (AlManei et al., 2017; Panizzolo et al., 2012; Pearce et al., 2018). Existing literature on lean SMEs has been criticized for focusing mainly on efficiency, compared to effectiveness improvement (Hu et al., 2015). The research focused specifically on employee roles in lean SMEs (Antomarioni et al., 2020; Chaplin et al., 2016; Panizzolo et al., 2012; Pearce et al., 2018; Rose et al., 2013) has found employee empowerment, supportive organisational culture, effective communication, and continuous learning are crucial factors that support the implementation and continuation of lean initiatives (Hines et al., 2011; Panizzolo et al., 2012; Pearce et al., 2018; Schmidt, 2011). Careful lean employee selection and proper reward increase employee involvement and engagement in lean implementation (Hu et al., 2015; M. Singh & Rathi, 2021). On the other hand, a lack of empowerment and benefits decreases engagement and participation, which may lead to lean implementation failure (Antomarioni et al., 2020). Thus, employee involvement, engagement, and participation are often neglected, although they are essential factors for the lean journey in SMEs (Achanga et al., 2006; Hines et al., 2011; Panizzolo et al., 2012). This research represents an attempt to provide a better understanding of the roles of FLEs in lean implementation for SMEs and address the operational benefits beyond efficiency improvements, as suggested by Hu et al. (2015).

1.2 Methodology

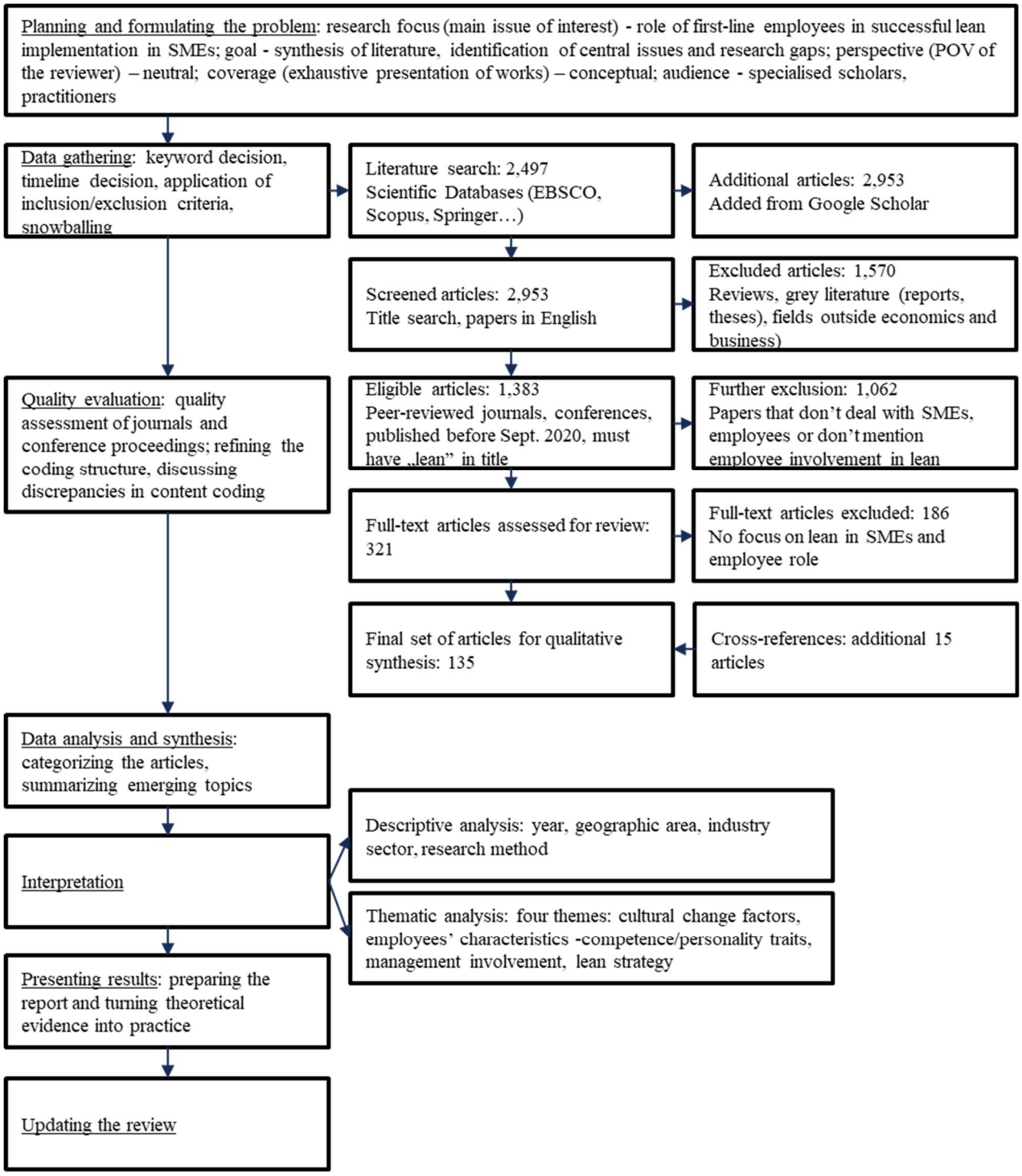
We have performed a systematic literature review to fully consider, evaluate, and synthesize existing research efforts (H. Cooper, 2015). Many authors have confirmed the importance of systematic literature reviews in identifying underexplored questions in specific areas to

provide better understanding (Cronin, 2011; Jesson et al., 2011). We followed Thomé et al. (2016) step-by-step research approach, depicted in Figure 1.

After defining the research's broad area and related research questions, we searched the Web of Science, Springer Link, Science Direct, Scopus–Elsevier, and Taylor & Francis databases, which cover most of the top publications in the field of management, avoiding a restrictive review of available literature. Therefore, as a proxy of quality, we included only international scholarly peer-reviewed literature published up to September 2020. Hence, we also included conference papers published in high-quality conference proceedings because they usually cover a large body of up-to-date knowledge (Bandara et al., 2015). In contrast, grey literature and working papers were excluded for rigour. Using brainstorming and snowballing, we selected the following search keywords/strings: "SME/small business," "Lean," and "employee/worker" (Table 1). Considering the specific topic of interest (Jesson et al., 2011) and the relevant criteria for inclusion (Figure 1), the initial search resulted in 2,497 papers of interest. We also searched Google Scholar to retrieve potentially relevant articles not included in the research databases, which expanded the selection to 2,953 papers. In the next stage, we omitted duplicates and literature unrelated to our areas of interest (e.g., Tanco et al., 2013), reducing the number of papers to 156. Using cross-references, 15 relevant articles were included in the final list. After reading the full-text papers, the number was reduced to 135 final papers.

Finally, we approached a careful analysis and synthesis of the articles. Following Tranfield et al. (2003), we covered general descriptive and thematic analyses to depict the selected research topic comprehensively. The descriptive analysis allowed a simple categorization of the selection of literature, the key journals and publishing trends, region and industry sectors, and research methods. On the other hand, the thematic analysis identified the main themes in the collected papers and potential future research questions. Through parallel and simultaneous coding and categorizing supported by the QDA Miner program, we refined the coding structure to summarize and understand the main emerging topics and discuss potential discrepancies in content coding until we reached a consensus. The calculated interrater reliability was high (0.93), showing sufficient coding consistency and agreement among the coders (Miles & Huberman, 1994). The results of descriptive and thematic analyses are discussed in the following sections.

Figure 1: Research approach and process



Source: Own work.

Table 1: Databases and search strings for the literature review

Database	Keywords/search string
Web of Science	(TS=(lean AND SME* AND employee*)) AND LANGUAGE: (English)
	(TI=(lean AND SME*) AND AB=(employee*)) AND LANGUAGE: (English)
	(ALL=(lean AND SME* AND employee*)) AND LANGUAGE: (English)
	(ALL=(lean AND small business AND employee*)) AND LANGUAGE: (English)
	(TS=lean AND ALL=(SME* AND worker*)) AND LANGUAGE: (English)
SpringerLink	lean AND SME AND employee
	lean AND SME AND worker
	lean (titled) AND small AND business AND worker
	lean (titled) AND small AND business AND employee
Science Direct	lean AND SME AND employee
	lean AND SME AND worker
	lean AND small business AND worker
	lean AND small business AND employee
Scopus–Elsevier	TITLE-ABS-KEY (lean AND sme* AND employee*)
	TITLE-ABS-KEY(lean AND SME* and worker*)
	(TITLE (lean) AND TITLE-ABS-KEY (small AND business AND employee)) AND DOCTYPE (ar OR cp)
	(TITLE (lean) AND TITLE-ABS-KEY (small AND business AND worker)) AND DOCTYPE (ar OR cp)
Taylor & Francis	[All: lean] AND [All: sme*] AND [All: employee*] AND [Publication Title: lean]
	[All: lean] AND [All: sme*] AND [All: worker*] AND [Publication Title: lean]
	[Publication Title: lean] AND [All: small business] AND [All: worker]
	[Publication Title: lean] AND [All: small business] AND [All: employee]
Google Scholar	allintitle: lean employee OR SME
	allintitle: lean worker OR SME

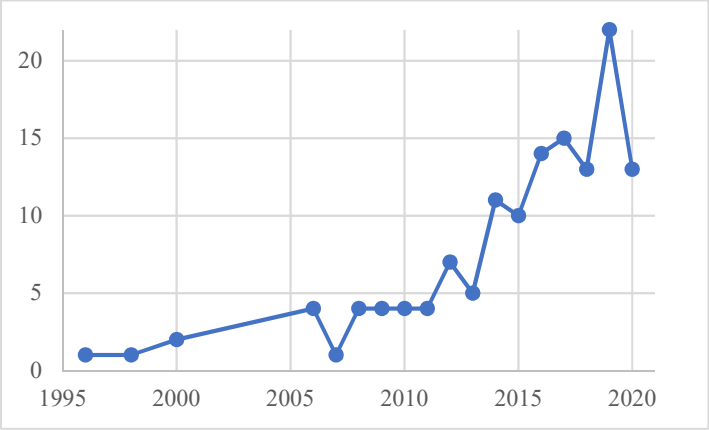
Note: TS = topic, TI = title, ALL = all fields, Booleans (AND). Boolean "AND" signifies all words in the search must be included in all results, "OR" if only one word of the search is included. TITLE-ABS-KEY signifies the search was limited to the title, abstract, and keywords of the papers. DOCTYPE signifies the type of document (we included both conference papers and scientific articles).

Source: own work.

1.3 Descriptive analysis

The descriptive analysis shows a continuous increase in publications addressing employee roles in lean initiatives in SMEs (Figure 2). The first published paper included in this analysis dates back to 1995 (O'Donnell, 1995). The number of research papers has grown exponentially, peaking in 2019. Figure 2 depicts the research trends addressing employees regarding lean applications in SMEs. The amount of research has grown steadily, gaining more traction from 2010 onwards, after which it showed continuous growth. Because we only considered research published up to September 2020, additional articles could have been published after that point that would meet our criteria.

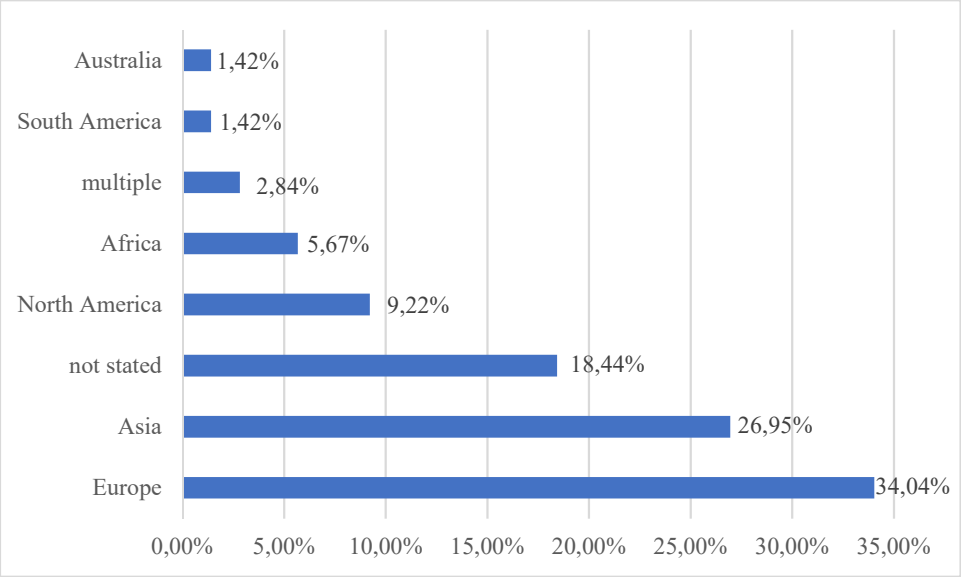
Figure 2: Number of papers published per year



Source: own work.

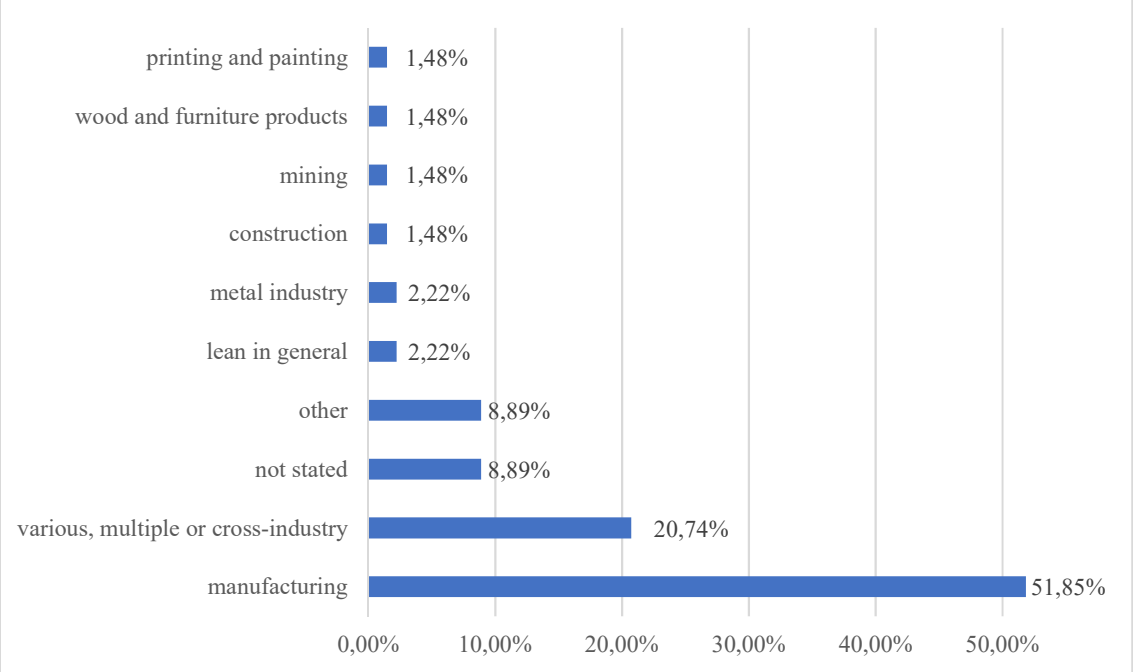
From the entire sample, 109 papers indicated the addressed geographic area (approx. 81% of the papers). The greatest emphasis has been on European firms (34%), followed by Asian ones (27%), whereas South America and Australia received the least attention (Figure 3). Further analysis of European and Asian studies found a majority had focused on lean implementation in the United Kingdom and India. The manufacturing sector was predominantly addressed (Figure 4, 52% of the papers, cf. Antomarioni et al., 2020; Nikolou-Walker and Lavery, 2009; Tan et al., 2013; Timans et al., 2016). Many papers (24%) considered multiple industries or presented cross-industry analyses (Nguyen, 2015; Robinson & Schroeder, 2009; Stanica & Peydro, 2016). Some literature reviews or conceptual papers did not address a specific industry focusing on lean in SMEs in general (de Treville & Antonakis, 2006; Lauver et al., 2018; Salma et al., 2018).

Figure 3: Researched regions in lean SME articles dealing with employee roles



Source: own work.

Figure 4: Researched industry in lean SME articles dealing with employee roles



Source: own work.

Out of 135 articles reviewed, 37.04% used questionnaires for their empirical research (cf., (Lauver et al., 2018; Marin-Garcia & Bonavia, 2015; Santos et al., 2015; Y. C. Wong et al., 2009) and 6.67% used various mixed methods (combination of questionnaires and interviews (Antosz and Stadnicka, 2017; Seppälä and Klemola, 2004) or observation and interviews (Lewchuk and Robertson, 1996; Stanica and Peydro, 2016)). A smaller number

of articles presented literature reviews or theoretically examined workers' roles in lean SMEs (Cullinane et al., 2013; de Treville & Antonakis, 2006; Dombrowski et al., 2012).

1.4 Review findings

Four main themes emerged from the analysis of literature on FLEs' role in lean implementation in SMEs: cultural change factors, employee characteristics (competence/personal traits), management involvement, and lean job design. In the following sections, we present a discussion of the main themes, their underlying factors, and the related literature. Enablers and barriers are identified for factors within each of the main themes.

1.4.1 Theme 1: Cultural change factors

Implementing lean in SMEs is not just a technical endeavor but a cultural transformation that requires shifts in organizational values, assumptions, and beliefs (Womack, 2007; Al-Najem et al., 2012). Despite this, lean has often been treated as a mere toolbox, with limited focus on the human and cultural dimensions necessary for its success (Andersson et al., 2006; Delbridge, 2005). We identified several factors inside this theme particularly concerning FLEs in lean SMEs and categorized them into commitment (engagement), lean awareness program, teamwork and collaboration, empowerment, and cultural characteristics in Table 2.

Commitment (engagement)

A strong commitment to continuous improvement is central to lean implementation, yet it introduces significant demands on FLEs (Liker & Meier, 2007). Employees must engage in problem-solving, multiskilling, and decision-making, but many are unprepared or unwilling to take on these expanded roles, leading to stress and dissatisfaction (Abolhassani et al., 2016; Vidal, 2007). While greater autonomy and decentralized decision-making can enhance motivation, they may also result in job strain when paired with high cognitive demands and production pressures (Hasle et al., 2012; Jackson & Mullarkey, 2000; Thanki & Thakkar, 2014). Additionally, excessive standardization in lean processes can diminish task identity and significance, further reducing employee engagement (AlManei et al., 2017; Brännmark & Holden, 2013; de Treville & Antonakis, 2006). If workers feel overwhelmed, they may disengage or even leave the organization (Bergquist & Westerberg, 2014). To mitigate these negative effects, organizations should balance job demands with adequate job resources, as suggested by the Job Demands-Resources model (Demerouti & Bakker, 2011; van Dun & Uittenbogaard, 2017).

Another stream of literature relates lean to standardized, scheduled, repetitive tasks with low technical uncertainty that result in reduced task identity, significance, and autonomy (Bruno

& Jordan, 2002; Mehta & Shah, 2005). Thus, excessive leanness limits workers' improvement ideas and autonomy and negatively affects employee engagement

Lean awareness program

Awareness and understanding of lean principles are critical for overcoming resistance, which often arises from perceived job insecurity, increased workload, or fear of mistakes (Vilda et al., 2019). SMEs frequently lack structured training programs, relying instead on informal in-house training, which may leave FLEs ill-prepared for lean adoption (Ramadas & Satish, 2018; Yadav, Jain, Mittal, Panwar, & Sharma, 2019). Insufficiently and inappropriately trained FLEs will hardly understand the lean philosophy and fundamentals (Chen & Meng, 2010), a crucial precondition for commitment to and involvement in lean. Additionally, inadequate training on health and safety procedures in lean SMEs could contribute to poor working conditions (Alkhoraif & McLaughlin, 2018b). Thus, SMEs must invest in systematic lean training to build competency and foster a culture of continuous improvement.

Teamwork and collaboration

Efficient teamwork fosters emotional support, making workers feel respected, empowered, and involved (Shokri et al., 2016). A team-based structure requires employees to be multi-skilled, flexible, and engaged, as they take on diverse responsibilities and rotate across positions Åhlström & Karlsson, 1996; de Treville & Antonakis, 2006). The success of these teams depends on active participation and strong task performance (V. Wickramasinghe & Wickramasinghe, 2016). However, granting autonomy to workers who are unprepared or unwilling to self-manage can lead to frustration and inefficiencies in decision-making (Scherrer-Rathje et al., 2009). Since FLEs in SMEs often face challenges in effective information transfer and delegation, developing their team problem-solving skills is essential (Gélinas & Bigras, 2004).

Uneven participation among team members can create resentment and undermine team effectiveness (Procter & Radnor, 2014). This is especially important for inexperienced shop-floor workers in SMEs, who might not be given a chance to be involved in decision-making or problem-solving (Che Mamat et al., 2014) Encouraging thoughtful involvement and fostering a culture of "respect for workers" can help address these concerns (de Treville & Antonakis, 2006). Ultimately, teamwork in lean production gives employees opportunities for feedback and provides support (Conti et al., 2006). By distributing responsibilities, organizations can further strengthen worker involvement in lean initiatives (Longoni et al., 2013).

Empowerment

Empowering FLEs in SMEs is essential, as they are primarily engaged in daily operations and require a supportive organisational culture to thrive (Panizzolo et al., 2012). Vidal

(2007) defines empowerment in lean as delegating authority to workers by increasing their skills, abilities, responsibilities, and capacities for decision-making, problem-solving, and continuous improvement. While in large enterprises (LEs), empowerment becomes more critical in the later stages of lean implementation when routines are established (Netland, 2016), SMEs benefit from early employee involvement. In these smaller companies, workers should not only be empowered to implement lean principles, but also design lean policies, and actively influence decision-making (Marin-Garcia & Bonavia, 2015).

Characteristics of culture

Successful lean implementation requires long-term cultural cultivation (Fu et al., 2015). Factors such as power distribution, degree of interdependence, uncertainty avoidance, and social norms, introduce differences in lean implementation (Bortolotti et al., 2015). Therefore, before implementing lean in SMEs, managers should carefully consider organisational and national characteristics that might influence adoption (Kull et al., 2014; Wangwacharakul et al., 2014). Lean tools should be adapted to fit specifics contexts, and viewed as an ongoing journey rather than a fixed state to be achieved post-implementation (Åhlström & Karlsson, 1996; Cullinane et al., 2013; Eswaramoorthi et al., 2011).

Table 2: Enablers and barriers of cultural change factors for first-line employees in lean implementation in SMEs

		CULTURAL CHANGE FACTORS
COMMITMENT/ ENGAGEMENT	►	Leadership, teamwork, innovation, and organisational culture increase employee engagement (Burawat, 2019; Li et al., 2015).
	►	Commitment, communication, work methods, and beliefs influence lean success perception (Losonci et al., 2011).
	–	Lack of understanding of lean benefits, job strain, and ambiguity lower commitment (Bergquist & Westerberg, 2014).
	–	Lean may be seen as additional work, leading to avoidance (Burawat, 2019).
	–	Excessive participation may lead to negative organisational outcomes (Brännmark & Holden, 2013).

To be continued

Table 2: Enablers and barriers of cultural change factors for first-line employees in lean implementation in SMEs (cont.)

LEAN AWARENESS PROGRAM	►	Lean awareness programs (training, mentoring) enhance engagement and reduce resistance (Alefari et al., 2017; Eswaramoorthi et al., 2011).
	►	Systematic lean training reduces resistance and fosters commitment by addressing concerns and promoting continuous improvement (Vilda et al., 2019).
	—	Lack of awareness of health and safety procedures harms working conditions (Alkhoraif & McLaughlin, 2018b).
TEAMWORK AND COLLABORATION	►	Team-based work structure promotes multi-skilled, flexible, engaged workers (Bayo-Moriones et al., 2008).
	►	Shared responsibilities enhance engagement by providing feedback, a voice in decision-making, and mutual support (Conti et al., 2006).
	—	Uneven team contributions cause resentment and reduce lean team effectiveness (Procter & Radnor, 2014).
EMPOWERMENT	►	Worker empowerment through decision-making and lean policy design boosts acceptance (Marin-Garcia & Bonavia, 2015) (Marin-Garcia & Bonavia, 2015).
	►	Lean fosters creativity and autonomy (de Haan et al., 2012) (de Haan et al., 2012).
	—	Lack of worker empowerment hinders lean acceptance (Bruno & Jordan, 2002; Lewchuk & Robertson, 1996).
CHARACTERISTICS OF CULTURE	►	High person-centred culture promotes mutual respect and trust (Kull et al., 2014).
	►	A culture of work environment, communication, and trust is crucial (Dora et al., 2016).
	—	Lean works less effectively in countries with high assertiveness and low uncertainty avoidance (Kull et al., 2014).

Note: ► represents enablers, and — represents barriers.

Source: own work.

1.4.2 Theme 2: Employee characteristics

Employee characteristics are essential for empowerment and participation in lean initiatives, as individual readiness for change influences lean implementation success. Readiness refers to employee beliefs, attitudes, and intentions about the need for change and the firm's ability to manage it (Armenakis et al., 1993). It is an important precursor to resistance (Vakola, 2014). Although some employees might view lean as an opportunity for improvement, others may perceive it as controlling and coercive, leading to resistance Losonci et al., 2017). Moreover, workers with low growth needs prefer routine work and resist change (Angelis et al., 2011). Differences in attitudes toward change depend on individual traits such as coping styles, motivation, personality, and self-esteem, with lower self-esteem linked to decreased openness to change (Bhamu & Singh Sangwan, 2014; Judge & Hurst, 2007). Supervisors should consider these individual differences and use transformational leadership to inspire employees (Afsar & Masood, 2018; Hofstede, 1980). List of all enables and barriers connected to this theme can be found in Table 3.

Creativity

Huo and Boxall (2018) found creativity to be essential for workers' participation in problem-solving and continuous improvement. In SMEs, FLEs are expected to contribute creatively to work-process design (de Haan et al., 2012; Yadav, Jain, Mittal, Panwar, & Lyons, 2019b). However, creative thinking requires job-relevant knowledge, enabling the exploration and recombination of stored information (Amabile et al., 1996). Hence, inductive–deductive reasoning in SMEs (e.g., quality management projects, training, knowledge-sharing, or cross-functional teams) can further stimulate creativity in FLEs (Kumar et al., 2014).

Confidence

Employee lack of confidence in lean is an essential barrier to lean manufacturing in SMEs (Ramadas & Satish, 2018), mainly due to a lower level of knowledge and expertise in using advanced technical and statistical tools (Thomas & Barton, 2006). Creating a supportive organisational culture in lean SMEs is essential to ease the fears of workers and increase their confidence (Ramadas & Satish, 2018). A carefully designed pilot implementation can help prevent dissatisfaction and maintain confidence (Marvel & Standridge, 2009). Additionally, supervisors who encourage experimentation and risk-taking enhance employee confidence and psychological safety.

Resistance and trust

Lean implementation affects different occupational groups in SMEs, with FLE typically exhibiting greater resistance to change compared to managerial staff (Huang, 2011; Antomarioni et al., 2020; Dombrowski et al., 2012; Salma et al., 2018). Resistance often stems from lack of appropriate training and knowledge on the lean concept and related objectives, tools, and techniques (Bakås et al., 2011). Understanding the causes of resistance

enables firms to reduce fear and increase trust by providing comprehensive information, sufficient training, and opportunities for workers to contribute ideas (Lodgaard et al., 2016; Longoni et al., 2013). Intensive communication, including shop-floor workers and supervisors in idea generation, and addressing workers' needs help counteract self-interest and fear Bhamu & Singh Sangwan, 2014). A less rigid hierarchy in SMEs allows closer communication, fostering trust in lean initiatives (Dora et al., 2016). Trustworthy and supportive managers will additionally support the acceptance of change among workers (Burawat, 2019; Cullinane et al., 2017; Mohammad & Oduoza, 2019).

Motivation

FLEs in lean SMEs face different environments, tasks, and motivational systems than managers (de Treville & Antonakis, 2006; Huber & Brown, 1991). In general, exposure to stressful situations reduces motivation, hindering lean implementation (Parker, 2003). However, FLEs in SMEs enjoy greater autonomy in work delivery, which enhances learning and motivation (Sterling & Boxall, 2013). SME managers play a key role in supporting employees, and preventing motivation decline (Yadav, Jain, Mittal, Panwar, & Sharma, 2019). Additionally, external supervision and peer pressure can motivate workers to keep investing efforts in lean initiatives (Bakås et al., 2011). In contrast, LEs may have plentiful HR practices that counteract the decreasing motivation (de Treville & Antonakis, 2006).

Knowledge and skills

Lack of knowledge of lean techniques and technical skills is a significant barrier to lean implementation in SMEs (Van Goubergen et al., 2011; Rose et al., 2013). A key challenge lies in workers' technical knowledge of their workplaces (Abu et al., 2019). In SMEs, tacit knowledge, accumulated over time through experience and co-worker interactions, is dominant (Dombrowski et al., 2012; Mohd Zahari et al., 2019). Workers often use past defects as learning opportunities to reduce waste (Eswaramoorthi et al., 2011). While collaborative learning and knowledge dissemination are promoted due to the flat structure of SMEs, they often face resource limitations that affect the workers' knowledge and skills (Pearce et al., 2018). In-house training and self-education are predominant methods of knowledge transfer in SMEs, as opposed to external consultancy in LEs (Kumar & Antony, 2008; Mourtzis et al., 2016; Stanica & Peydro, 2016). Additionally, skills shortages and employee turnover make knowledge creation and transfer more demanding, as lean activities require skill variety and broad scope for action (Coetzer et al., 2017).

Adaptability

The sustainability of lean depends on employee adaptability to new tasks, technologies, and procedures (Sony & Mekoth, 2019). Formal communication, participative practices, and dynamic training programs promote this adaptability (Bocquet et al., 2019), which is most optimal when employees begin to grow in their roles, usually after two years of implementing lean (Carlsson & Aronsson, 2017).

Table 3: Enablers and barriers of employee characteristics factors for first-line employees in lean implementation in SMEs

EMPLOYEE CHARACTERISTICS

CREATIVITY	►	Creativity improves job satisfaction and reduces turnover (de Haan et al., 2012).
	►	Task rotation, training, and reallocation fuel creativity (Majava & Ojanperä, 2017).
	►	Creativity and innovative environments foster lean transformation (Darcy et al., 2014; Saunders et al., 2014; Yadav, Jain, Mittal, Panwar, & Lyons, 2019b).
	►	Problem-solving demands are linked to increased creativity (Huo & Boxall, 2018).
	—	Unused creativity leads to low motivation and lack of suggestions (Majava & Ojanperä, 2017).
CONFIDENCE	►	Involvement in reporting and correcting issues enhances confidence (Kull et al., 2014).
	—	Lack of worker confidence hinders lean implementation (Ramadas & Satish, 2018).
RESISTANCE AND TRUST	►	Trust in the lean team enhances commitment to lean (Bruce et al., 2011).
	►	Both affect-based and cognition-based trust are essential for participation (Li et al., 2015).
	►	Trust promotes knowledge sharing (Eze et al., 2013).
	—	Resistance to change directly impacts FLE ability to engage with lean practices (AlManei et al., 2017; Antomarioni et al., 2020; Ramadas & Satish, 2018).
MOTIVATION	►	Lean improvements motivate the entire organization toward continuous improvement (Bakås et al., 2011).
	►	Problem-solving activities boost motivation (Cullinane et al., 2013; Huo & Boxall, 2018).
	—	Lack of management commitment to lean reduces motivation (Grigg et al., 2020).
KNOWLEDGE AND SKILLS	►	Collaborative learning and knowledge-sharing in SMEs promote skills development, supporting lean implementation (Pearce et al., 2018).
	—	Lack of lean knowledge is a barrier to implementation (Rose et al., 2013; Van Goubergen et al., 2011).
	—	Insufficient training and skills hinder lean implementation (Abu et al., 2019; Moeuf et al., 2016).

To be continued

Table 3: Enablers and barriers of employee characteristics factors for first-line employees in lean implementation in SMEs (cont.)

ADAPTABILITY	►	Adaptable employees support the implementation of new lean tools (Dombrowski et al., 2010).
	▬	Employees struggle to adjust to continuous changes in tasks, technologies, and procedures (Sony & Mekoth, 2019).

Note: ► represents enablers, and ▬ represents barriers.

Source: own work.

1.4.3 Theme 3: Management involvement

The success of lean implementation in SMEs requires management's consistent financial support, clear improvement vision, active involvement, and commitment to a long-term improvement philosophy (Bhamu & Singh Sangwan, 2014). This commitment often demands short-term financial sacrifices (Liker & Meier, 2007) and considerable managerial effort, as a full lean transformation typically spans at least five years (Ohno, 1988; Womack, 2007).

Management commitment to lean

Management commitment is as critical success factor for successful lean implementation in SMEs (Achanga et al., 2006; Hernandez-Matias et al., 2019; Thanki & Thakkar, 2014). Although top management support alone is insufficient, it is necessary to sustain the implementation of lean initiatives in SMEs (Worley & Doolen, 2015). Effective implementation also relies on line managers who act as engaging leaders, fostering autonomy, responsibility, feedback and teamwork among employees (Netland, 2016; Schaufeli et al., 2009).

Communication of lean strategy

Communication of managers' visions, understanding, and experiences with shop-floor workers is of utmost importance in creating satisfactory awareness, trust, and confidence among the workers (Burawat, 2019; Mohammad & Oduoza, 2019). SMEs, with their flatter hierarchies, offer greater flexibility and adaptability to changes (Shokri et al., 2016), but unclear communication can hinder employee understanding of lean's potential and importance (Worley & Doolen, 2015). Miscommunicating about lean strategies can provoke confusion among workers about their roles and responsibilities in the lean change initiative and eventually cause resistance to change (Andrew & Sofian, 2012; Puvanasvaran et al., 2009) amd difficulties in obtaining accurate operational data (Bhamu & Singh Sangwan,

2014). Two-way formal and informal communication between workers and managers strengthens engagement (Hilton & Sohal, 2012; Worley & Doolen, 2015), ensuring that lean practices are conveyed in a way that balances efficiency with employee well-being (Gambatese et al., 2017).

Manager—first-line employee relationship

A strong manager–FLE relationship is essential for effective lean implementation. Hierarchical employee engagement, where top managers support their subordinates through training, coaching, and mentoring, helps ensure lean principles reach shop-floor employees (Alefari et al., 2017) Considering the flatter organisational structure and more effortless communication in SMEs, the commitment and knowledge of managers who directly communicate with FLEs play a crucial role (Jobin, 2015; Pearce et al., 2018). Managers can help FLEs overcome the limitations of poor understanding through close collaboration in explaining the lean methodology (M. Adam et al., 2020; Huo & Boxall, 2018). Conversely, poor communication can leave workers feeling undervalued and unwilling to participate in process improvements (Bruce et al., 2011), particularly in defensive cultures where FLEs may feel blamed for errors (Cadden et al., 2020) – a challenge that can be amplified in SMEs due to more direct feedback (Conti & Gill, 1998; Delbridge et al., 1992).

Support (information feedback, receptiveness to suggestions, external support)

Managers play an essential role in supporting FLEs tby helping them manage work stressors and increased work demands while protecting their well-being (Bruno & Jordan, 2002; Huo & Boxall, 2018; Ng & Sorensen, 2008). Direct and clear supervisor feedback reduces role ambiguity through goal clarification, preventing lean-related strain, ultimately enhancing job satisfaction and lowering turnover intention in lean SMEs (de Treville & Antonakis, 2006; Delbridge, 2005; Huo et al., 2019). Informative feedback and openness to employee suggestions motivates workers to improve their performance continuously.

When internal expertise is lacking, SMEs may benefit from external lean specialists, whole in-depth knowledge can support implementation (Kumar & Antony, 2008; Yadav, Jain, Mittal, Panwar, & Lyons, 2019b). However, the effectiveness of such collaboration is highly dependent on efficient communication between management and the specialist (Matt & Rauch, 2013). Additionally, sustained top management support is vital in later implementation stages to sustain the continuous improvement philosophy among workers (Netland et al., 2015).

List of all enablers and barriers of management involvement for FLEs in lean SMEs can be found in Table 4.

Table 4: Enablers and barriers of management involvement factors for first-line employees in lean implementation in SMEs

MANAGEMENT INVOLVEMENT

MANAGEMENT COMMITMENT TO LEAN	►	Management involvement is a key soft practice that determines lean implementation success in SMEs (Achanga et al., 2006; Gandhi et al., 2018; Hu et al., 2015; Mamat, Md Deros, et al., 2015; Yadav, Jain, Mittal, Panwar, & Lyons, 2019b).
	►	Middle-management commitment is crucial as they directly communicate with FLEs (Alefari et al., 2017).
	►	Top management commitment positively impacts operational performance as part of human-related lean practices (Hernandez-Matias et al., 2019).
	—	Lack of management commitment is a major barrier, affecting other key challenges in lean implementation (Jobin, 2015; Yadav, Jain, Mittal, Panwar, & Sharma, 2019).
	—	Long-term failure to commit to lean leads to difficulties in sustaining the methodology (Mamat, Md Deros, et al., 2015).
COMMUNICATION OF LEAN STRATEGY	►	Two-way formal and informal communication between managers and employees enhances engagement and understanding of lean initiatives (Hilton & Sohal, 2012; Worley & Doolen, 2015).
	—	Lack of communication between workers and supervisors prevents successful lean implementation (Ramadas & Satish, 2021; Yadav, Jain, Mittal, Panwar, & Sharma, 2019).
MANAGER – FLE RELATIONSHIP	►	Management support predicts workplace attitude and commitment (Glover et al., 2011).
	►	First-line manager support helps reduce exhaustion and buffers the impact of work intensification on well-being (Huo et al., 2019).
SUPPORT (feedback, receptiveness to suggestions, external support)	►	Feedback motivates workers to seek progress and is linked to a high-performance culture (Kull et al., 2014).
	►	Feedback enables quick responses to defects, deviations, and increases accountability (Mehta & Shah, 2005).
	►	Organizational support from senior management enables lean implementation by assigning responsibility and decision-making tools (Caldera et al., 2019; Hallstedt et al., 2013).
	►	External consultant support is important for SMEs (AlManei et al., 2017).
	—	Lack of management commitment to lean reduces motivation (Grigg et al., 2020).

Note: ► represents enablers, and — represents barriers.

Source: own work.

1.4.4 Theme 4: Lean job design

Effective lean job design requires HR practices such as training, contingent compensation, and flexibility to align worker interests organizational goals, fostering continuous discretionary efforts (Molina et al., 2004). The soft side of management plays a crucial role in encouraging continuous improvement and learning, reinforcing employee commitment to lean initiatives (Koo et al., 2014).

Work design

The impact of lean job design on employee engagement and well-being depends on management's approach. While lean's additional problem-solving demands can be challenging, their negative effects are mitigated by sufficient training, employee involvement in decision-making, and first-line manager support (Huo and Boxall, 2018). This aligns with the comcept of 'creative tension', where balancing empowerment and engagement with work demands is crucial for successful lean implementation (Lee, 2004). Investing in employee well-being and stronger worker relations helps counterbalance the high standardization and increased control inherent in lean systems (MacDuffie, 1995).

Work complexity and pace (work intensification)

Job complexity and intensification often exhaust FLEs by depleting their energy and emotions, leading to health strain and dissatisfaction, especially when resources for lean implementation are insufficient in SMEs, resulting in overburdened workers and weakened commitment to lean Abu et al., 2019; Achanga et al., 2006). Greater production pressures and the removal of slack can cause role overload, further deteriorating worker health when FLEs are unable to meet tasks demands or when performance expectations exceed capacity (Conti et al., 2006; Kaminski, 2001; McLain & Jarrell, 2007). Additionally, skilled workers may view tasks such as machine cleaning and maintenance as undignified burdens (R. Singh et al., 2013). While job rotation can reduce repetitiveness and alleviate monotony Gnanavel et al., 2015), it may also lower job satisfaction and worker retention (Bouville & Alis, 2014). Resistance to flexible work arrangements can stem from concerns over skill erosion and loss of bargaining power (Cartwright & Cooper, 1997). Furthermore, lean's standardization may reduce FLE autonomy and freedom, contributing to dissatisfaction (Hasle et al., 2012).

Appraisal and rewards

Motivators for FLEs differ significantly from those of knowledge workers. While knowledge workers are primarily driven by autonomy and work content (T. C. Harris & Locke, 1974; Ronen & Sadan, 1984), FLEs are more motivated by financial rewards and job security. Vidal (2007) critiques the oversimplification of intrinsic rewards in lean environments, emphasizing the need for a balance between intrinsic and extrinsic rewards. A lack of proper reward policies at the shop flow can create barriers to lean success (Abolhassani et al., 2016). These cultural and hierarchical differences should be considered in the design of rewards

and recognition schemes (Netland, 2016). Without adequate financial incentives, FLEs may perceive lean implementation as additional work without reward (Burawat, 2019). Given that lean performance outcomes are often hard to measure and take time to manifest softer reward practices, such as ongoing recognition and praise, are especially valuable in the initial stages of lean implementation (Netland et al., 2015). Linking intrinsic and extrinsic rewards to lean objectives improves employee commitment, reduces turnover, and mitigates the common retention issues in SMEs Panizzolo et al., 2012; Ramadas & Satish, 2018). FLEs often prefer bonus financial payments to compensate for the increased work pressure and multitasking, which can help prevent turnover (MacDuffie, 1995; Snell & Dean Jr, 1994). However, free-rider behaviour and poorly mixed teams can demotivate high performers who do not receive appropriate compensation, which can be mitigated by introducing individual and collaborative team target (D. C. Jones & Kato, 2012; V. Wickramasinghe & Wickramasinghe, 2016).

Table 5 encompasses the enablers and barriers of lean job design factors for FLEs in lean SMEs.

Table 5: Enablers and barriers of lean job design factors for first-line employees in lean implementation in SMEs

	LEAN JOB DESIGN
WORK DESIGN	► Communication facilitates acceptance of change and reduces resistance to new lean concepts (Puvanasvaran et al., 2009).
	– Lack of informing workers about lean strategies leads to confusion about roles and responsibilities (Bhamu & Singh Sangwan, 2014; Worley & Doolen, 2015).
	– A lack of formal training or inadequate methods for training lean tools hinders lean implementation (N. D. Minh et al., 2017).
	– SMEs avoid training programs due to financial/time constraints, leading to insufficient skills development (Yadav Jain, Mittal, Panwar, & Sharma, 2019)
	– Differences in micro, small, and medium enterprises reveal issues in lean training (Shrimali & Soni, 2017).

To be continued

Table 5: Enablers and barriers of lean job design factors for first-line employees in lean implementation in SMEs (cont.)

WORK COMPLEXITY AND PACE (work intensification)	►	Lean's health-impairing demands require enhanced job resources to cope with high-paced, high-involvement work (Cullinane et al., 2014).
	►	Work intensification reduces well-being but can be alleviated with greater supervisor support (Huo et al., 2019).
	▬	Work intensification due to lean implementation increases stress and worsens health (Anderson-Connolly et al., 2002; Bouville & Alis, 2014).
	▬	High worker participation in lean SMEs may lead to increased workload and role overload (Brännmark & Holden, 2013).
APPRAISAL AND REWARDS	►	Rewards and recognition are crucial internal success factors for lean implementation in SMEs (AlManei et al., 2017; Mohammad & Oduoza, 2019).
	►	Reward systems foster trust and commitment between managers and employees (Moeuf et al., 2016).
	►	Financial rewards have greater benefits in the post-implementation phase when employee output is visible (Bhamu & Singh Sangwan, 2014) (Bhamu & Singh Sangwan, 2014).
	▬	Lack of recognition and rewards leads to employee frustration during lean implementation (Bocquet et al., 2019).
	▬	SMEs face financial constraints that hinder a suitable reward system for employees (Sahoo & Yadav, 2018).

Note: ► represents enablers, and ▬ represents barriers.

Source: own work.

1.5 Discussion and future research avenues

While existing research underscores the crucial role of human factors in lean adoption (Losonci et al., 2017; Pearce et al., 2018), the literature remains fragmented with a partial understanding of FLEs' behaviours and the contextual elements that influence their engagement in lean pracitces (Hu et al., 2015; Schmidt, 2011). In light of these gaps, this study contributes by comprehensively synthesizing the roles of FLEs in lean implementation within SMEs, with a focus on the key themes and factors identified through content analysis. These themes – cultural change factors, employee characteristics, management involvement

and lean job design – serve as foundational elements in the development of a lean implementation model that fully considers FLEs' contributions.

One of the central findings is that successful lean implementation hinges on fostering high commitment and engagement from FLEs. This is enabled through effective management support, targeted training and education, active involvement in decision-making, and a well-balanced job design that addresses the demands-resources tension. Notably, FLEs often perceive lean as overly controlling and demanding, particularly with regard to the technical knowledge and problem-solving skills required, leading to fear, frustration, and resistance (Antomarioni et al., 2020; Conti et al., 2006; Shokri et al., 2016). These findings highlight a significant gap in the literature, as existing studies have not adequately addressed how these negative perceptions can be mitigated. This study suggests that enhancing FLEs' understanding of lean, through awareness programs and engagement with external consultancy, can bolster motivation and confidence, thereby laying the groundwork for sustained commitment and engagement (Longoni et al., 2013; Vidal, 2007; Vilda et al., 2019). This aligns with previous calls for more nuanced interventions to address these human factors during the early stages of lean implementation.

The role of line managers in SMEs is particularly pivotal, given the flat organizational hierarchy typical of such settings. Research by Cullinane et al. (2017), Panizzolo et al. (2012), and van Dun & Uittenbogaard (2017) suggests that line managers can empower FLEs by fostering a culture of collaboration, encouraging teamwork, and adopting a non-punitive approach to error management. This underlines an important point often overlooked in the literature: while lean practices can be perceived as top-down, managerial approaches grounded in trust and communication can significantly mitigate resistance and foster engagement. This insight contributes to the ongoing debate about the relational dynamics between management and employees during lean implementation.

A key challenge highlighted in the literature and confirmed by this study is the balancing of job demands and resources, a tension that can lead to job strain and turnover if not managed appropriately (de Treville & Antonakis, 2006; Demerouti & Bakker, 2011; Vidal, 2007). The study suggests that a participative approach to job design, where FLEs are meaningfully involved in decision-making and problem-solving, can help alleviate these pressures. However, existing literature has not sufficiently explored the interplay between these factors, particularly the synergistic relationships between job demands, resources, and management practices. This study proposes that future research should investigate how these factors interact, particularly how cultural change within organizations influences employee characteristics, and how managers can effectively integrate cultural change into lean job design.

Reward systems also emerge as a critical enabler of lean success. Existing literature has emphasized the importance of financial rewards and recognition in motivating employees (Marin-Garcia & Bonavia, 2015; Netland et al., 2015; Ramadas & Satish, 2018). This study

extends this understanding by proposing a phased approach to rewards, where intrinsic rewards (e.g., recognition, praise) are more appropriate during the early stages of lean implementation, and extrinsic rewards (e.g., bonuses, pay raises) are needed as employee contributions become more visible in later phases (Bhamu & Singh Sangwan, 2014; Vidal, 2007). This nuanced perspective addresses a gap in the literature, which has not adequately differentiated reward strategies across different phases of lean implementation. Moreover, a lack of recognition or a poorly designed reward system can significantly hinder employee motivation and engagement, serving as a barrier to lean adoption (Abolhassani et al., 2016; Bocquet et al., 2019).

Despite these contributions, the study also reveals several gaps that warrant further exploration. The interrelationships between the themes and factors—such as how cultural change influences employee characteristics and how management's role in fostering such changes intersects with job design—remain underexplored. Future research should focus on these synergies and cause-and-effect relationships, particularly how management activities that influence one factor (e.g., training) can have cascading effects on others (e.g., job design, motivation). Additionally, empirical research should investigate how different organizational contexts—such as industry, strategy, and leadership—affect the relevance and effectiveness of the identified enablers and barriers.

This study also highlights the need for a more refined classification of levers and barriers, particularly regarding their importance in different phases of lean implementation. While previous research has identified several enablers and barriers, there remains a lack of clarity on how these factors evolve across pre-implementation, implementation, and post-implementation stages. Research aimed at developing clear guidelines for managers, based on these classifications, would be invaluable for SMEs looking to navigate the complexities of lean adoption. Furthermore, the study suggests that future research should examine the relationship between different lean methodologies and the specific management practices that can facilitate their adoption, with a particular focus on SMEs.

Finally, while this study has contributed to the literature by synthesizing the roles of FLEs in lean implementation, further research is necessary to address the gaps related to performance outcomes, particularly in terms of operational and financial benefits. Many of the benefits associated with FLEs' roles, such as improved motivation, job satisfaction, and creativity, are intangible and often indirectly affect organizational performance. Thus, future research should explore ways to measure these benefits more effectively and assess their impact on the overall success of lean implementation in SMEs. Moreover, research should broaden its focus to include cross-sector comparisons, particularly between SMEs and large organizations, as well as between different geographical contexts, including less developed countries where the dynamics of lean implementation may differ significantly.

1.5.1 Practical implications

Our work has several practical implications for managers embarking on lean implementation in SMEs. Results show that themes and their factors related to the role of FLEs in lean implementation are interrelated. Therefore, managers need to design programs considering cultural change factors, employee characteristics (competence/personal traits), management involvement, and lean job design simultaneously. Practitioners can utilize initial lists of levers and barriers identified based on previous research as guidelines for more successful lean implementation in SMEs through exploiting levers and overcoming barriers.

Results show the importance of FLEs' active participation in improvement activities, requiring careful rethinking of cultural aspects that might affect the technical and operational implementation of the lean program (Dombrowski & Mielke, 2014). Managers should consider FLEs' characteristics carefully because they work in a different context than managers, who are at higher hierarchical levels (different work environments, motivation systems, responsibilities) (Huber & Brown, 1991). Hence, supportive and transformational leadership will foster the acceptance of lean among workers through greater confidence in the program and psychological safety.

Lean has been criticized in terms of the increased demands and pace of work, short training requirements, lack of flexibility, exploitation of workers, and related negative consequences on employee motivation, well-being, and commitment (Boyle & Scherrer-Rathje, 2009; Niepce & Molleman, 1998; Williams et al., 1992). Thus, SME management must provide sufficient financial, time, and learning resources to prevent overburdened workers and inconsistent lean commitment. Moreover, we emphasize the importance of job design for maximizing positive interactions between FLEs to sustain motivation and efficiency. In addition, differences in motivators among FLEs should be considered when establishing a reward policy. Nevertheless, it is crucial to consider lean implementation a long-term journey requiring cultural changes highly dependent on the specifics of the context.

1.6 Limitations and conclusion

A potential limitation of this chapter is the failure to access and discover relevant literature on the topic. By relying on broad search terms and the most extensive databases, we tried to find the essential literature. We do not rule out the possibility that we missed a small portion of the relevant literature, but we do not expect these papers would dramatically affect the results. In addition, we attempted to limit researcher objectivity in the thematic analysis by using qualitative software for coding and categorizing. However, we cannot preclude some element of subjectivity in some coding decisions. Overall, by identifying the key themes, we have provided a guide and research agenda for researchers to analyse and enrich the existing evidence and a reference for more successful lean implementation.

This chapter summarizes the research regarding first-line employees in lean SME settings. Their role in successful lean implementation cannot be overlooked. We identify themes and factors inside them that represent enablers and barriers regarding the role of FLEs. Themes include cultural change factors, employee characteristics, management involvement and lean job design. This is only a starting point for further exploration and development of a balanced demands-resources job design to enable the proper engagement, motivation and commitment of FLEs to lean in SMEs.

Since workers have a key role in reducing waste in business processes, they are crucial for a successful and sustainable lean business. FLEs are closest to the core activity of a business (line production, providing services). But, as already mentioned, there are both positive and negative effects of lean use. To keep workers willing to participate in lean activities (including properly using lean methods and tools), companies must focus on maintaining high levels of engagement ("a positive, fulfilling, affective-motivational state of work-related well-being that is characterized by vigour, dedication, and absorption" (Schaufeli et al., 2006) and low exhaustion (i.e., consequences of intense physical, affective, and cognitive stresses, such as prolonged exposure to particular job demands) (Demerouti et al., 2001). This will ensure high-quality job performance. This is done through providing adequate job resources - any job aspects which help in attaining work goals, stimulate worker growth and development and reduce job demands (Demerouti et al., 2001). Job demands, on the other hand, are job aspects with require physical or mental efforts from workers (Demerouti et al., 2001).

Lean production requires high degrees of responsibility of first-line workers for their respective work areas (Åhlström & Karlsson, 1996; Bendell, 2005). Workers are expected to be multi-skilled and flexible (Forza, 1996), and have the ability to work in teams. The culture of lean includes proactive work and co-worker support, and regular and efficient contribution. Dahlgaard & Dahlgaard-Park (2006, p. 572) state that "The success of the system depends on everybody's participation". Therefore, the high-quality job performance of first-line workers is essential to sustaining lean since their high job involvement (V. Wickramasinghe & Wickramasinghe, 2016), and participation are central to lean (Forza, 1996). It's important to understand how first-line employees get accustomed to lean tools and techniques which reshape their work tasks (G. L. D. Wickramasinghe & Wickramasinghe, 2016) to understand worker job performance (Losonci et al., 2011). To perform effectively, workers must have skill variety, responsible autonomy and work facilitation (Angelis et al., 2011), but also management must offer adequate par or remuneration (V. Wickramasinghe & Wickramasinghe, 2016). Worker performance is the outcome of workforce management, and it may contribute to firm performance (Appelbaum et al., 2000; Boxall & Macky, 2007).

Based on the findings in the first chapter, we conclude the use of the JD-R model would be appropriate for the continuation of this research. Using the JD-R model is particularly suited to the purpose of this research since (1) it has a broad scope which allows the inclusion of

all relevant job characteristics; (2) the flexibility allows tailoring the model to specific organisational needs and (3) it can be used as a communication tool for all stakeholders (Schaufeli, 2017). Since organisational context factors (foundations of lean) affect group behaviours (relationships between workers, customers and managers) but also individual worker responses (McMackin & Flood, 2019), it is sensible to use a model which offers great flexibility and broad scope, such as the JD-R model.

The continuation of this thesis will focus on identifying job demands and resources specific to FLEs in a lean SME context. First, we will identify all potential job demands and resources based on existing literature and expand the findings through interviews with managers and FLEs in lean SMEs. The interviews will suggest which of the generally identified job demands and resources pertain to the SME context.

2 CHAPTER 2: IDENTIFYING JOB CHARACTERISTICS SPECIFIC TO FIRST-LINE EMPLOYEES IN LEAN SMES

2.1 Introduction

Implementing lean methodology in a company changes the entire job design for workers (Cullinane et al., 2013). Workers are faced with additional responsibilities such as quality control, continuous improvement, and maintenance (Delbridge et al., 2000) and they experience different job demands such as production pace or task interdependency (Cullinane et al., 2013), which might harm employee well-being (Anderson-Connolly et al., 2002; Parker, 2003). Since employee participation is essential for successful long-term lean results (Marin-Garcia & Bonavia, 2015; Scherrer-Rathje et al., 2009), it is in organisations' interest to create adequate lean work design which retains the benefits and long-term results of lean, but also caters to worker well-being.

The impact of lean on the well-being of workers has been studied numerous times and in diverse fields (Beraldin et al., 2019), recently reaching a consensus that implementing lean is neither inherently good nor bad for the workers (Hasle et al., 2012; Longoni et al., 2013), and depends on different lean practices implemented (Bortolotti et al., 2015). Over 50% of studies on lean and well-being of workers show negative outcomes, and 35% mixed (both positive and negative) outcomes (Koukoulaki, 2014). Despite this, the operations management field still lacks research insights on workers' well-being (Beraldin et al., 2019; Brito et al., 2019; Longoni et al., 2013), especially in SMEs. The increased implementation of lean in SMEs requires careful consideration of the impact of lean on employee well-being in SMEs (Belhadi et al., 2018). There is evidence that factors such as top management commitment, company culture implementation approach and others differ in larger enterprises versus SMEs, determining the levels of lean success (Dora et al., 2016). There is also a different approach to first-line employees in lean SMEs, finding that lean initiatives may fail due to lower involvement of FLEs in training and lean learning (Dora et al., 2016),

and hiring low-skilled workers (Achanga et al., 2006) or not supporting them. The negative effects of lean on worker well-being affect their performance, which in turn leads to an operational performance decline (Sobhani et al., 2015, 2017). What is more, the motivational and emotional outcomes of workers in a lean environment are linked to customer satisfaction (Corrêa et al., 2007). Therefore, it is vital to implement an adequate lean job design which enables workers to understand and adequately implement lean in their work, while maintaining high levels of motivation and minimizing the health-impairing elements of lean. We aim to discover job characteristics of lean SMEs and their impact on worker well-being to suggest a more favourable lean job design (Seppälä & Klemola, 2004) which engages workers and ultimately brings higher job performance and sustainable lean results.

The job demands and resources specific to SMEs' lean settings will be identified through the existing literature on the general JD-R model, applied to a lean context and the literature on lean job characteristics in the SME context. Using a qualitative interview approach, we are verifying the job demands and resources identified through a literature review and placing them in a lean SME context (Cullinane et al., 2013). With this, we intend to further elaborate our theoretical findings on the role of FLEs in lean SMEs, and explore and map worker outcomes. Namely, we wish to (1) examine the job demands workers face in lean SMEs, (2) shed light on job resources they obtain to ease the work strain, and (3) explore the potential worker outcomes stemming from identified job demands and resources, namely exhaustion and work engagement. From an academic perspective, we are adapting the JD-R model to a lean SME environment, upgrading the model and adjusting it to this context.

2.2 Theoretical model - the job demands-resources model

In the literature, worker well-being is mainly explored through the job demands-resources (JD-R) model, exploring positive work characteristics which impact worker engagement (job resources) and negative job characteristics which impact their exhaustion (job demands). The design and organisation of work imply the intrinsic motivational power of work. The key assumption in the JD-R model is that job strain arises when job demands are high, and job resources are limited (Demerouti et al., 2001) and that every occupation has specific job characteristics which impact worker well-being (Demerouti & Bakker, 2011). Inappropriate lean design results in high job demands, which lead to role overload and job stress, impairing worker health and well-being (Lewchuk & Robertson, 1996).

The JD-R model rose to prominence at the beginning of the 21st century, with the article from (Demerouti et al., 2001). This article researched the antecedents of burnout and presented a leading model for researching job stress, alongside the Job Demands Control (JD-C) Model by Karasek, (1979) and the Effort Reward Imbalance (ERI) model by Siegrist, (1996). The common link between these models is twofold: they focus on job stress, and the main assumption they have is that employee well-being and employee health both stem from a balance of positive and negative job characteristics, where positive ones are named job resources, and the negative ones job demands (Schaufeli & Taris, 2014). The difference

between JD-R and the other models is that JD-R is heuristic, and it is widely adaptable in many job stress contexts since it assumes that employee health, well-being and motivation may be affected by any demands and resources. It is very flexible, and not tied to a specific set of concepts (like the JD-C model and ERI model are). This allows for broad application, incorporating variables in the model which are explicitly selected considering the needs of specific organisations. This means we can adjust the constructs representing job demands and job resources depending on the needs that occur in lean SMEs.

The JD-R model focuses on researching job demands employees encounter in an organisation, at the same time using the provided job resources to reduce negative job demand impacts. These demands represent any aspects of the job where physical or mental efforts are required and they consequently bring specific costs such as physiological and psychological (Demerouti et al., 2001). Job demands may be problem-solving demands (Huo & Boxall, 2018), work intensification, role overload, and work or production pressure (Schaufeli & Taris, 2014). Job demands might not necessarily have a negative nature. However, they may cause additional energy exertion if high efforts are required to attain work goals (Demerouti & Bakker, 2011) and the employee can't recover from those efforts adequately (Meijman & Mulder, 2013). This may cause fatigue, irritability and exhaustion (Schaufeli & Taris, 2014). Job resources, however, mitigate these adverse effects. They are any job aspects that serve to reduce the costs job demands bring, help in achieving work goals or inspire personal growth and progress (Demerouti et al., 2001). Job resources include autonomy (Dijkhuizen et al., 2016), social support (either supervisors or co-workers) (Korunka et al., 2009), performance feedback (Schaufeli & Taris, 2014), and task identity. If employees have few job resources, the effect of job demands on exhaustion is particularly impactful (Bakker et al., 2003). Job resources may be found on the task level, tied to a job position, at the interpersonal or organisational level. The list of JR levels can be found in Table 6.

Table 6: Levels of job resources

Level	**Job resource**
Organisational level	Wages, job security, career opportunities
Interpersonal level	Support from co-workers and supervisors, team climate
Job position	Participation in decision-making, job clarity
Task level	Task identity, skill variety, autonomy, performance feedback, task significance

Source: adapted from Demerouti & Bakker, 2011, p. 2

The JD-R model explains the motivational process dependent on positive job characteristics (job resources) (Schaufeli & Bakker, 2004), which positively impact work engagement. Job resources, as the focal predictors of work engagement (Christian et al., 2011) play both extrinsic and intrinsic motivational roles. They stimulate workers' positive relation to work (work engagement) by achieving work goals or satisfying worker's need for autonomy, competence and similar (Van den Broeck et al., 2008). This is in line with Hackman's (1980) Job Characteristics model which claims job resources can be motivating at the task level (e.g. feedback, task significance). Work engagement is "a positive, fulfilling, work-related state of mind that is characterized by vigour (that is, high levels of energy and mental resilience while working), dedication (referring to a sense of significance, enthusiasm, and challenge), and absorption (being focused and happily engrossed in one's work)" (Schaufeli & Taris, 2014). Engaged workers identify with their work, and put more effort into it (Bakker et al., 2014). Also, the assumptions behind job resources in the JD-R model align with Hobfoll's (2001) conservation of resources (COR) theory stating workers are primarily motivated to maintain and accumulate resources.

The other side of the JD-R model is the health-impairment process dependent on negative work characteristics (job demands). When a job is very demanding, (for example, workers experience role overload), it exhausts workers' physical and mental resources, which in turn leads to health issues and energy depletion (state of exhaustion) (Bakker et al., 2003; Demerouti et al., 2001; Demerouti & Bakker, 2011). As already stated, however, job demands are not necessarily bad. There is a distinction between challenge and hindrance job demands (Cullinane et al., 2013; Demerouti & Bakker, 2011; LePine et al., 2005; N. P. Podsakoff et al., 2007). Hindrance job demands inhibit the ability of workers to achieve goals. They positively associate with exhaustion and negatively with vigour (which represents one aspect of work engagement besides dedication and absorption) (Van den Broeck et al., 2010). These may be, for example, role overload or role ambiguity. Challenge job demands, on the other hand, although requiring efforts from employees, promote their personal growth and bring rewarding work experiences (N. P. Podsakoff et al., 2007). They are positively related to vigour and unrelated to exhaustion (Van den Broeck et al., 2010), and these may be problem-solving demands, time pressure or responsibility.

It is important to note that there is no finite list of job demands and resources applied in companies, but rather a contingent perspective is applied where any job characteristic (categorized as either a job demand or job resource) may affect the well-being of workers and must be considered depending on the context (Beraldin et al., 2019). Table 7 shows job demands and job resources in various contexts.

There are several interactions possible inside of the JD-R model. The basic postulates are that job demands positively affect exhaustion and negatively affect work engagement and that job resources negatively affect exhaustion and positively affect work engagement. There are, however, additional mechanisms that may occur inside the model. These are the "coping" and "buffering" effects. *The buffering effect* signifies job resources acting as a

moderator between job demands and exhaustion, where they diminish the effect of JD on exhaustion (Bakker et al., 2007; Beraldin et al., 2019; Huo & Boxall, 2018). Work situation context and individual worker characteristics buffer the effect of a stressor (Kahn & Byosiere, 1992, p.622). *The coping effect* shows the moderation of job demands on job resources and work engagement, where it enhances the impact of JR on work engagement, especially when job demands are high (Bakker et al., 2007; Beraldin et al., 2019; Huo & Boxall, 2018), meaning resources become most noticeable when work conditions are demanding (Demerouti & Bakker, 2011). Beraldin, Danese, and Romano (2019) connect these effects to the conservation of resources theory (Hobfoll, 2002), stating additional job resources become relevant only when the conditions become more demanding or challenging, and workers may likely use resources as coping mechanisms.

Table 7: Examples of job demands and job resources from the literature

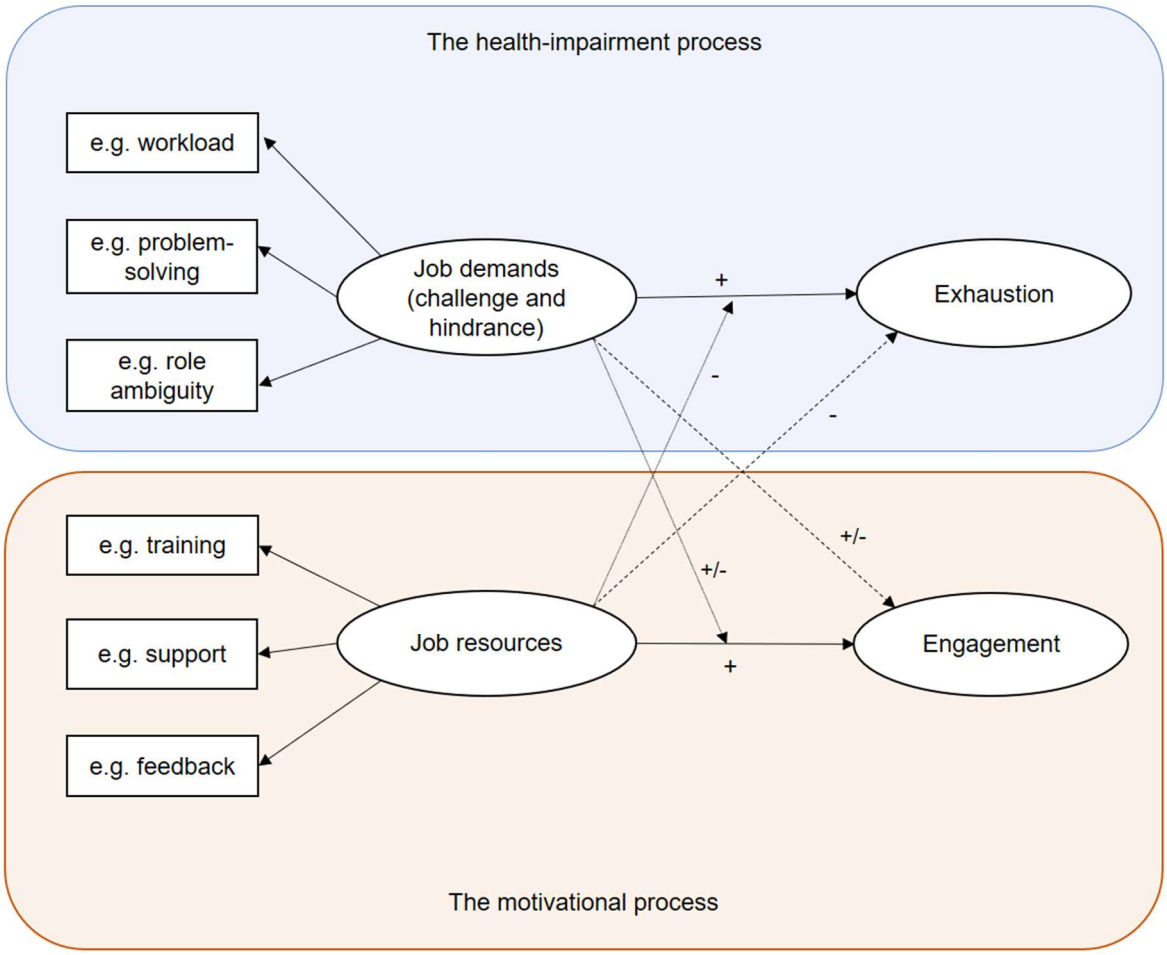
Job characteristic	**Examples**
Job demands	Hindrance – role overload, role ambiguity, work pace, physical demands, monitoring, task interdependency, administrative hassle, emotional conflict, organisational politics, resource inadequacies, role conflict, situational constraints Challenge – problem-solving, time pressure, (production) responsibility, time urgency, workload (quantitative and subjective), level of attention required by the job, job complexity, pressure to complete tasks, social relationships
Job resources	Wages, rewards, job security, access to information, career and learning opportunities, co-worker and supervisor support, team climate, participation in decision-making, job clarity, job control, task identity and variety, skill variety and development, autonomy, independence, training, performance feedback, task significance, boundary control

Source: own work on the basis of existing literature on the JD-R theoretical model (Beraldin et al., 2019; Crawford et al., 2010; Cullinane et al., 2013; Demerouti et al., 2001; Demerouti & Bakker, 2011; Kaiser et al., 2020; Mojtahedzadeh et al., 2021)

There has been both longitudinal and cross-sectional evidence confirming the theory and mechanisms behind the model. The majority of research on the JD-R model is cross-sectional, looking at a specific national or industry context (Baeriswyl et al., 2016; Bilotta et al., 2021; Guenzi & Nijssen, 2021; Mojtahedzadeh et al., 2021). There has been research among blue and white-collar workers, teachers, volunteers, across nations etc. (Mojtahedzadeh et al., 2021; Naidoo-Chetty & du Plessis, 2021; Shevchuk et al., 2018). Looking at JD-R cross-sectionally, the main assumptions of the model were strongly supported across various contexts. Longitudinal research on JD-R also showed strong

support for the main assumptions, as well as support for no reversed causation (that neither burnout nor engagement predicts job demands or job resources) (Schaufeli & Taris, 2014). Figure 5 shows the theoretical expansion of the JD-R model.

Figure 5: The expanded Job Demands-Resources Model



Source: adjusted from c.f. (Cullinane et al., 2014; Demerouti et al., 2001; Demerouti & Bakker, 2011; Schaufeli & Taris, 2014)

2.3 Job demands and resources in lean companies

2.3.1 JD-R in lean

Any production/service system has interrelated sections: production/service support, business operation and environment which impact production (Moayed & Shell, 2009). Workers in lean experience similar demands as other companies in different industries, contexts or organisational structures (e.g. work pace, problem-solving job demands or feedback job resources) (Beraldin et al., 2019; Huo & Boxall, 2018; Lindskog et al., 2016). However, there are many differences in lean work organisations as opposed to non-lean ones. For example, workers in lean companies experience blame for defects, ergonomic

difficulties, decreasing cycle time (Conti et al., 2006) or monitoring (Cullinane et al., 2013). Excessive workload has been mentioned as a major job demand impacting employee exhaustion in lean (Huo & Boxall, 2017b; Lindskog et al., 2017; Ulhassan et al., 2013), similar to problem-solving demands positively influencing worker exhaustion, but also work engagement (Beraldin et al., 2019; Cullinane et al., 2013, 2014; Huo & Boxall, 2017, 2018).

Looking specifically at job resources in lean, soft lean practices are mentioned as a bundle in Beraldin, Danese, and Romano (2019), including small group problem solving - teamwork, top management leadership for lean, coaching, shop floor contact with managers - management support or management commitment, and employee suggestions. Specific job resources related to lean may include lean tool usage (Lindskog et al., 2017), line manager support, boundary control, teamwork and continuous improvement programs.

There are significant differences in lean concerning teamwork, statistical process control techniques and reliance on quality feedback (Forza, 1996). One of the basic principles of lean is focusing on people in production which add value (Womack et al., 1990). Therefore, the production and maintenance tasks and responsibilities shift from team leaders and engineers to first-line workers (Delbridge et al., 2000) which are adding value to the product/service (Poppendieck et al., 2011). Lean requires higher first-line worker involvement and lower parts and materials consumption (Moayed & Shell, 2009). It is believed they should be the centre of resources, information, process design and decision-making authority and organisational energy (Poppendieck et al., 2011). To enable this, companies must offer training for lean so that workers are prepared for new work requirements (Moayed & Shell, 2009) and upgrade their skills so they can autonomously address production problems and solve them quicker (Poppendieck et al., 2011). Additionally, lean emphasizes teamwork, innovation, multiskilling, collaboration and other requirements. Some requirements, such as lack of buffers or continuous flow of production result in time pressure on workers and negatively impact their well-being negatively (Berggren, 1993; Niepce & Molleman, 1998). Since there are no buffers, there are high demands on workers to try hard constantly (Womack et al., 1990).

Sensible differences are found between first-line employees and the rest of the company. Seppälä & Klemola (2004) discovered FLEs experience different workloads and development opportunities. High exhaustion is related to the amount of work, poor social climate, and poor change management for lean transformation. Although FLEs mainly feel autonomous in their work, they don't perceive their work to be of high variety. Collaboration of first-line employees within and between units is required in lean. However, its level depends on the opportunities workers have to develop at work, social climate, quality of group work and exchange of information (Seppälä & Klemola, 2004).

There is research that applies the JD-R model to a lean context, but it is not extensive. We found 11 articles that specifically explore the JD-R model in lean settings in general. Only the articles that explicitly state they are researching the JD-R model in a lean setting are

included, plus an additional article with a similar theory, using Karasek's (1979) Job demand-support-control model (Conti et al., 2006), which can also be used for this analysis since it also includes job demands to represent all stressors influencing employees psychological well-being. There are plenty of various job demands and job resources identified, but some are emphasized and repeated more. Most often mentioned job demands include work pace (Beraldin et al., 2019; Conti et al., 2006), problem solving (Beraldin et al., 2019; Cullinane et al., 2014; Huo & Boxall, 2017b), task interdependence (Cullinane et al., 2014) and excessive workload (Huo & Boxall, 2017b; Lindskog et al., 2016, 2017). Highlighted job resources in lean setting include training (Huo & Boxall, 2017, 2018), manager support (Ulhassan et al., 2014) and feedback (Cullinane et al., 2014). Table 8 presents all articles exploring worker well-being in the lean setting.

Table 8: Lean job demands and job resources and their connection to various worker outcomes

Research	Type of JC	Variable	Health-related outcomes (HRO)	Motivational outcomes (MO)	General outcomes
Beraldin, Danese, and Romano, 2019			Exhaustion	Work engagement	
	Job demands	JIT-related JD (work pace, interdependence)	+	-	
		problem-solving JD	inconclusive	inconclusive	
	Job resources	soft lean practices (small group problem solving - teamwork, top management leadership for lean, coaching, shop floor contact with managers - management support or management commitment, employee suggestions)	-	+	
	Contr. variables	personal data (age, gender, shift vs day work, organisational tenure, experience in current position, current work area)			
	Note	the buffering effect of SLP (JR) on exhaustion caused by JIT JD			
Cullinane et al., 2014	Job demands		Exhaustion	Work engagement	
		problem-solving	+		
		work pace	+		
		task interdependence	+		
		accountability	+		
	Job resources	boundary control	-	+	
		feedback	-	+	
		training	-	+	
	Note	no support for the buffering effect of job resources (non-significant)			
Cullinane et al., 2013			HRO	MO	
	hindrance JD	work pace	-		
		physical demands	-		
		monitoring	-		
	challenge JD	problem-solving		buffer between JR and MO +	
		production responsibility		buffer between JR and MO +	
	JR	task resources (boundary control and performance feedback)	+		
		knowledge resources (skill utilization, variety and development)	+		
		social resources (interaction and support)		+	
	Note	mediators (experienced meaning, learning and development, social facilitation, need satisfaction) - motivational (productivity, product quality, waste elimination, financial performance) and negative-health outcomes (turnover, absenteeism)			

To be continued

Table 8: Lean job demands and job resources and their connection to various worker outcomes (cont.)

Research	Type of JC	Variable	Health-related outcomes	Motivational outcomes	General outcomes
Cullinane et al., 2017				Day-level work engagement	
	Job demands	task interdependence			
		boundary control			
	Job resources	general work engagement		+	
		tenure		+	
		worker type		-	
		day-level skill utilisation		mediated relationship (day-level seeking resources) +	
				moderated relationship (task interdependence, boundary control)	
		day-level seeking challenges		+	
Huo and Boxall, 2018			Exhaustion	Work engagement	
	Job demands	problem-solving	inconclusive	+	
	Job resources	training	inconclusive	+	
		participation in decision-making	inconclusive	+	
		line manager support	inconclusive	+	
	Note	problem-solving JD can increase exhaustion only when soft lean practices are at a very low level, buffering effect and coping effect confirmed			
Huo and Boxall, 2017			Exhaustion	Work engagement	
	Job demands	role overload	+		
		problem-solving demands	+		
	Job resources	training	-	+	
		top management support	inconclusive	+	
		remuneration (level of pay)	-	+	
		distributive justice	-		
	Control var.	age, tenure, gender			

To be continued

Table 8: Lean job demands and job resources and their connection to various worker outcomes (cont.)

Research	Type of JC	Variable	Health-related outcomes	Motivational outcomes	General outcomes
Lindskog et al., 2016			Exhaustion	Engagement in development	Job satisfaction
	Job demands	excessive workload	+		-
	Job resources	psychological safety	-		+
		job security	-	+	+
		development resources	-	+	+
		job control	-	+	+
		role clarity		+	+
		participation (participation in decision making, opportunities to influence, information as participation)	-	+	+
		lean tools (visual follow-up boards, standardised work, 5s (housekeeping), VSM	various	various	various
	Contr. variable	age, gender, education level, hospital, manager			
Lindskog et al., 2017			-	-	Idea implemen. or generation
	Job demands	excessive workload			+
	Job resources	psychological safety			-
		personnel stability			
		development resources			+
		job control			
		role clarity			
		participation			-
		lean tools visual follow-up boards, standardised work, 5s (housekeeping), VSM			
	Control var.	age, gender, education level, hospital			
Rodríguez et al., 2017					Job satisfaction
	Job demands	perceived JD			-
	Note	perceived job autonomy and core self-evaluations as moderators		+	
	Control var.	gender, age, organisation			

To be continued

Table 8: Lean job demands and job resources and their connection to various worker outcomes (cont.)

Research	Type of JC	Variable	Health-related outcomes	Motivational outcomes	General outcomes
Ulhassan et al., 2014					Successful lean implementation
	Job demands	quantitative demands			0
		tempo at work			0
		cognitive demands			0
		emotional demands			0
		demands for hiding emotions			0
	Work organisation and job content	influence at work			+
		possibilities for development			+
		meaning of work			+
		commitment to the workplace			+
		rewards at work			+
	Interpersonal relations and leadership	predictability			+
		role clarity			+
		social support (colleagues and supervisors)			+
		social community			+
	Values at the workplace	horizontal trust			0
		vertical trust			0
		justice and respect			0
Conti et al., 2006			Relation to job stress		
	Job demand	work pace and intensity	+		
		frequency of resource removal	+		
		long working hours	+		
		decreasing cycle time	+		
		working for absent workers	+		
		blame for defects	+		

To be continued

Table 8: Lean job demands and job resources and their connection to various worker outcomes (cont.)

Conti et al., 2006 (cont.)	Job demand (cont.)	display of individual output	-		
		ergonomic difficulties	+		
	Job support	team working	+		
		peer and supervisor support	+		
		ill-fitting party	-		
		workflow interruption	-		
		lack of training	-		
		lack of tools	+		
	Job control	buffer inventory	-		
		work pace control	-		
		autonomy for process improvements	-		
		consultation for changes in working conditions	-		
		continuous improvement programs	+		
		job rotation	-		
		level of LP implementation			
	Note	uses Karasek's Job demand-support-control model			

Note: JC - job characteristics, JR - job resources, JD - job demands, JIT - just in time, SLP - soft lean practices, HRO – health-related outcomes, MO - motivational outcomes, VSM - value stream mapping

Source: own work.

2.3.2 Lean tools and the impact on worker outcomes

The negative effects of lean on workers depend on work design decisions, sector type and types of lean tools and methods implemented (Conti et al., 2006; Hasle et al., 2012; Jackson & Mullarkey, 2000). For example, there are at least 100 different lean methods and tools according to the Lean Six Sigma Pocket Toolbook (George et al., 2004). However, many are mentioned sporadically in the literature or rarely used. The most frequently used lean methods and tools are VSM, 5S, Kaizen, Kanban, Standard work, TPM, SMED, JIT, Poka-Yoke, Jidoka (Autonomation), Andon, Visual management and Cellular manufacturing *(Bhamu & Singh Sangwan, 2014)*. When choosing tools, companies must consider the company size, industry, current organisational culture, and ownership (level of unionization). Some authors argue that general lean principles and methods can be applied across sectors (Pearce et al., 2018). It is the company's job to choose a set of lean tools that fits the organisation well. Poor tool choice means an unsustainable lean company in the long run and sometimes failure in lean implementation. The compa*ny experiences poor outcomes and loses confidence in lean as a methodology for better production results* (Marvel & Standridge, 2009). Table 9 shows a list of lean methods and tools most often mentioned in lean SME papers. Sahoo (2018) already made a list of authors and lean practices used in SMEs based on 24 different research papers up to 2018. The following table additionally identifies lean SME tools mentioned in research articles up to the year 2020.

Each of the bundles and tools impacts worker outcomes and their well-being differently. For instance, Just-in-time (JIT) approach in lean demands less inventory and fewer variations in work. It aims to reduce flow times, have less material handling, and make fewer work choices. This may impact employees directly. Literature suggests numerous benefits of JIT, such as plentiful cost reductions (inventory, labour cost, standard hours, throughput time, operating space and work-in-progress) and positive increases in production and product shipments. It reduces cycle time and brings the product or service faster to a market. There are, however, certain risks in implementing JIT practices, particularly for SMEs. It is essential for companies to find suppliers close to them. Also, minimum order policies may pose a threat to SMEs, who sometimes might need smaller amounts of materials. Just-in-time (JIT) in lean is connected to various worker mental and physical health issues, such as musculoskeletal disorders or psychosocial effects (Brenner et al., 2004; Koukoulaki, 2014). Job stress is strongly connected to Just-In-Time production. To avoid this, when implementing JIT, organisations need to invest in long-term training programs (Hiltrop, 1992) and employee development programs (Power & Sohal, 1997).

Table 9: List of lean practices used in SMEs – evidence from the literature

Lean bundle*	Lean practice (tool/method)	1	2	3	4	5	6	7	8	Total
JIT	SMED/Setup time reduction (cycle time reduction, quick changeover)	14	*	*	*	*	*	*	*	21
	Kanban (Pull production) (pull system, pull system production, kanban-system)	13	*	*	*	*		*	*	19
	Visual control (visual management, notification system, Andon)	10		*	*	*		*	*	15
	Lot size reduction (small lot sizing, Just-In-Time)	10		*		*		*	*	14
	Value Stream Mapping	9		*		*		*	*	13
	Continuous flow	10	*			*		*		13
	Cellular Layout (cellular manufacturing)	10				*		*		12
	Heinjunka (levelling the workload, level scheduling, production levelling)	6		*	*	*		*	*	11
TQM	Kaizen (continuous improvement)	10		*		*		*	*	14
	Standardized Work/Process	9		*		*			*	12
	Poka-yoke (mistake proofing, error proofing)	8				*		*	*	11
	Quality management programs (total quality management)	8				*				9
	Jidoka (Automation)	7								7
	Supplier-related practices (supplier involvement, supplier quality, lean supply chain)		*		*			*		3
	Customer-related practices (customer involvement)		*		*			*		3
TPM	5S (workplace organisation or 6S)	14		*	*	*	*	*	*	20
	Total productive maintenance (preventive maintenance)	10	*	*	*	*	*	*		16
HRM	Employee training and teamwork (people empowerment, workforce engagement)	9				*		*	*	12
	Employee involvement		*		*	*		*		4
	Cross-functional team (quality circles)					*		*	*	3
Connected practices	Six Sigma					*		*		2
	PDCA					*			*	2

Note: The table includes only tools mentioned more than two times in lean SME papers.

**Sources for distributing lean bundles: (Ahuja & Khamba, 2008; Dow et al., 1999; Godinho Filho et al., 2016; Liker, 2004; Mirdad & Eseonu, 2015; Shah et al., 2008)*

(1) (Sahoo & Yadav, 2018) list of authors mentioning lean tools used in SMEs until 2018 (numbers indicate the number of authors mentioned using a specific tool); (2) Dora et al., 2014; (3) Alkhoraif et al., 2019; (4) Yadav, Jain, Mittal, Panwar & Lyons, 2019 ; (5) Pereira & Tortorella, 2018; (6) Valverde-Curi et al., 2019; (7) Alefari et al., 2020; (8) Buehlmann & Fricke, 2016

Total quality management (TQM) practices include continuous improvement, customer satisfaction, learning, cost-of-quality monitoring, etc. (Kaynak, 2003). One of the findings connected to TQM claims employee fulfilment directly affects customer satisfaction (Anderson et al., 1994; Grandzol & Gershon, 1997). Since good final inspection and low or

no rework increase competitive advantage (Flynn et al., 1995), it puts pressure on employee efficiency. Their empowerment, on the other hand, partially improves performance (Powell, 1995), and knowledge, compensation and recognition decrease the total cost of quality (E. E. Adam et al., 1997). Employees are required to continuously monitor quality-related issues and make decisions (Ho et al., 1999), identify and solve problems. Companies must ensure employee satisfaction to exploit the benefits of employee involvement (Kaynak, 2003). They also need to decentralize and delegate for employees to monitor, detect and correct quality problems. The behavioural factors (such as employee empowerment) bring higher competitive advantages than TQM tools (Samson & Terziovski, 1999). There is low usage of quality tools in SMEs (Fernandes et al., 2013; Sousa et al., 2018), so they need to prioritize improvement actions (Teixeira et al., 2015). Some of the TQM tools may involve employees in data gathering or suggesting improvements which in turn positively effects firm performance.

Total productive maintenance (TPM) focuses on maintenance prevention design, enhancing economic efficiency of equipment and reliability and maintainability engineering (Nakajima, 1988; Suzuki, 2017). It enhances the effectiveness of lean since it emphasises asset care so that it operates at optimum efficiency. This includes cleaning and inspection, checks and monitoring and preventive maintenance and service efficiency (Willmott & McCarthy, 2000). TPM's proactive approach implies preventive, corrective and predictive maintenance (Ramakrishnan & Nallusamy, 2017), which requires worker autonomy and skill, as well as engagement. It involves all employees, from managers to first-line workers and is based on promoting productive maintenance in autonomous small-group activities (Nakajima, 1988). It requires operator training, quality control, production scheduling and equipment maintenance, as well as autonomous maintenance (Johnson & Johnson, 2005). Maintenance activities are often standardized (Ramakrishnan & Nallusamy, 2017) and carried out regularly.

Human resource management (HRM) practices (sometimes also considered soft lean practices) concern workers and the interactions they have with the system, and they are oftentimes neglected when exploring lean companies (Sakthi Nagaraj et al., 2019). HRM practices may be grouped on the individual, team and organisation level (Tortorella & Fogliatto, 2014), and include a formal recognition system, feedback, performance evaluation, information sharing and other practices. It focuses mainly on the worker skill and knowledge development, career planning, evaluation and providing coaching (Gilley et al., 2009; Patterson et al., 1997; Pfeffer, 2001). Most recommended practices at the individual level are coaching and participative activities; at the team level are small group activities, a performance evaluation system and communication and information sharing; and at the organisational level guidelines deployment and employees skills development policies (Tortorella & Fogliatto, 2014). Most commonly used HRM practices in lean include training, job security, internal promotion and contingent remuneration (Bonavia & Marin-Garcia, 2011). The impact of those practices can be seen on employee productivity, turnover

and absenteeism (Ghebregiorgis & Karsten, 2007) and increases firm performance (Kim & Bae, 2005). HRM practices support work process standardization and flexibility of workers and maintain relationships between workers and supervisors (Bonavia & Marin-Garcia, 2011).

2.3.3 JD-R in lean SMEs

There are some studies that have already explored the effects of lean manufacturing on worker well-being (Beraldin et al., 2019; Cullinane et al., 2014; Huo & Boxall, 2017, 2018) through the JD-R model, but focusing on lean use in general (Table 8). We found no works in the literature so far specifically focusing on SMEs. Research on lean SMEs still lacks clear distinctions on JD and JR. Thus, room exists for research to explain the plausibility of the JD-R model in the lean context in SMEs, which we intend to carry out, answering the following research questions:

RQ3: What are lean-specific job demands for workers in lean SMEs?

RQ4: What are lean-specific job resources for workers in lean SMEs?

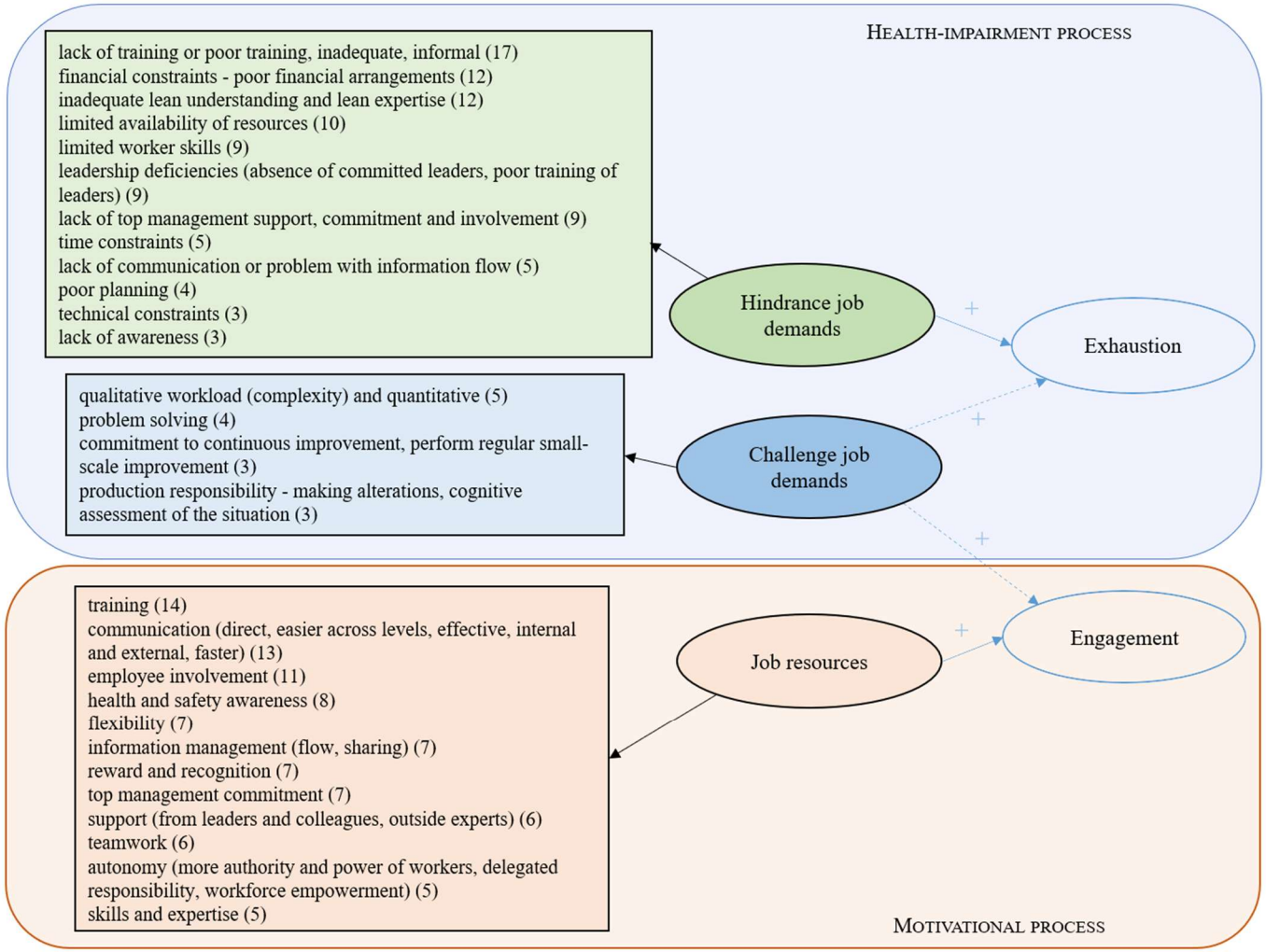
We will apply the JD-R model in a lean SME setting by extracting job characteristics from the lean SME literature. This was partially done in the first chapter, where we theoretically explored the role of workers in lean SMEs. We further analysed the job characteristics specific to this context and divided them into job demands (namely, job challenges and job hindrances) and job resources. In this chapter, we further extracted job characteristics mentioned in articles exploring lean SMEs, focusing only on articles that describe lean job characteristics and the impact on workers. General work characteristics were mentioned in lean SME papers, and we analysed the context in which these work characteristics were mentioned and allotted them into JD or JR according to the definitions of the model. As a result, job characteristics related to lean SMEs are presented in the Table 10, distributed as challenge JD, hindrance JD or JR. According to research so far, problem-solving is still the most prominent challenge job demands, regardless of the context (be it SMEs or large enterprises), alongside qualitative workload (job complexity) and quantitative workload. Specific to lean setting is, however, the commitment to continuous improvement and production responsibility. Challenge job demands are the least represented job characteristics in the lean SME literature - majority of the papers focus on hindrance job demands and available job resources. Hindrance job demands are the most mentioned in the literature, with lack of training as the predominant job demand (including poor training, inadequate or informal training). Following right after are the financial constraints (poor financial arrangements). Inadequate lean understanding and expertise can be directly tied to the lack of training workers receive regarding lean.

Table 10: List of identified job demands and job resources in lean SMEs from literature

Lean SME challenge job demands	qualitative workload (complexity) and quantitative (5) problem solving (4) commitment to continuous improvement, perform regular small-scale improvement (3) production responsibility - making alterations, cognitive assessment of the situation (3) *fast decision-making, multitasking (2)* *unlimited demand on competence and versatility, job enlargement, work intensification, multi-skilling, time constraints related to work, high innovativeness (1)*
Lean SME hindrance job demands	lack of training or poor training, inadequate, informal (17) financial constraints - poor financial arrangements (12) inadequate lean understanding and lean expertise (12) limited availability of resources (10) limited worker skills (9) leadership deficiencies (absence of committed leaders, poor training of leaders) (9) lack of top management support, commitment and involvement (9) time constraints (5) lack of communication or problem with information flow (5) poor planning (4) technical constraints (3) lack of awareness (3)
Lean SME job resources	training (14) communication (direct, easier across levels, effective, internal and external, faster) (13) employee involvement (11) health and safety awareness (8) flexibility (7) information management (flow, sharing) (7) reward and recognition (7) top management commitment (7) support (from leaders and colleagues, outside experts) (6) teamwork (6) autonomy (more authority and power of workers, delegated responsibility, workforce empowerment) (5) skills and expertise (5)

Note: the number in brackets represents the number of times a certain job characteristic was mentioned in research. Source: own work.

Figure 6: Job demands and resources in lean SMEs: a JD-R model perspective



Source: own work.

We also emphasize that the JD-R model categorizes workplace factors into job demands (aspects that require sustained effort and can lead to strain) and job resources (aspects that help employees achieve work goals, reduce demands, or foster growth and development, support employees). It conceptually differentiates job resources from job demands, rather than treating them as opposite ends of the same spectrum: a resource is not simply the absence of a demand, and a demand is not just the absence of a resource. Accordingly, we identified "training" as a job resource and "lack of training" as a hindrance job demand. Training equips employees with the necessary skills, knowledge, and confidence to perform their tasks efficiently in a lean SME environment. As a critical job resource, training enhances employee competence and work engagement, helps them manage job demands more effectively, encourages autonomy and proactive problem-solving and reduces stress and uncertainty (Bakker et al., 2004; Parker et al., 2001; Saks, 2006; Schaufeli & Bakker, 2004). On the other hand, lack of training as a hindrance job demand creates obstacles that make work more stressful and challenging. In lean SMEs, where efficiency and precision are emphasized, inadequate training can lead to role ambiguity, increase frustration and stress due to unclear expectations or inability to meet lean performance standards, hinder employee ability to adapt to continuous improvement requiremens and leaves workers unprepared for lean challenges (Bhamu & Singh Sangwan, 2014; Rizzo et al., 1970; Xanthopoulou et al., 2007a).

This dual categorization is essential because it captures both the positive and negative aspects of training in lean SMEs. It underscores that organizations must not only invest in training but also actively prevent training deficiencies, as failing to do so can transform an intended resource into a demand. If "lack of training" were simply a very low level of training as a resource, it would suggest a linear relationship where having less training only reduces positive outcomes, rather than introducing additional stressors and inefficiencies that actively impair workers. Thus, "lack of training" isn't just an absence of a positive factor; it actively contributes to negative outcomes like job strain, frustration, and performance issues. Creating this distincion enables analysis on the role of "lack of training" in causing exhaustion, frustration and decreased job performance, rather than just lower engagement. Furthermore, identifying it as a job demand, companies are more likely to see it as a risk factor that requires intervention rather than just a lower level of investment in an optional resource.

Comparing the job characteristics mentioned in lean JD-R research (not specifically focusing on SMEs), we can conclude there is great emphasis on problem-solving in lean, but also demands regarding work pace, and workload. Challenge job demands are emphasized more than hindrance JD. Similar constraints appear in lean SMEs, however, there is much greater emphasis on hindrance JD, mentioning lack of resources as the primary demand on workers – resources including training, finance, physical resources, time constraints, etc. Also, in SMEs, there are limited worker skills and inadequate lean knowledge and expertise. Training, management colleague support, and feedback are equally important in all lean

companies. However, job control and role clarity are not mentioned in lean SMEs. They instead include flexibility, health and safety awareness and direct communication as important resources for working in lean.

2.4 Research design

Connecting lean and the JD-R model implies identifying lean elements (methods, tools, specific job characteristics) that could affect differences in job characteristics, which in turn affect worker outcomes. As already mentioned, the JD-R model could be adjusted depending on the researched context.

We will be measuring job demands, resources and well-being on the individual level (exploring the perceptions of workers). This is in line with previous research done on JD-R model (Bakker & Demerouti, 2017) and also in lean context (Beraldin et al., 2019; Cullinane et al., 2013, 2014; Huo & Boxall, 2017, 2018).

2.4.1 Multiple case study methodology

A case study is "a type of research where a particular individual, program, or event is studied in depth for a defined period of time" (Leedy & Ormrod, 2015, p. 271). Case studies aim to "gain an in-depth (and up-close) examination of a “case” within its real-world context" (Yin, 2018, p. 62). They primarily intend to capture the complexity of certain (or multiple) cases while fully taking into consideration contextual conditions. It relies on multiple sources of evidence and triangulates it to corroborate findings. Multiple-case design includes multiple cases in a single study, but this type of research is still scarce in research on lean implementation (Erdil et al., 2018). Comparing multiple cases allows for generalizability of findings (Hesse-Biber & Leavy, 2010) and a more robust and compelling study (Merriam & Tisdell, 2015; Yin, 2018), whereas a single case study may lack generalizability (Leedy & Ormrod, 2015, p. 272).

Researching this topic through a multiple case study was appropriate for several reasons. In this study, real-life experience from workers and management of lean SMEs are expected to provide a deeper understanding of lean job design and its impact on workers. Also, this study draws theoretical conclusions on lean SME job characteristics based on a comparative analysis across individual cases. Worker and management real-life experiences in lean SME contexts bounded the focus of this study. In choosing companies for multiple case study, we aim for literal replications (Yin, 2018, p. 106). Selecting companies with this goal requires prior knowledge of the outcomes and the researchers expecting to replicate similar conditions from case to case (Yin, 2018, p. 106). For this reason, we selected companies with a similar lean maturity level, ensuring they have lean implemented for at least three years, and use at least several lean tools from each lean bundle. The companies were all similar in size.

A qualitative case study is appropriate for this chapter since this method focuses on exploring a particular topic through open-ended questions and words describing participant experiences (Creswell, 2017). The researcher is closely engaged in the study to deeply understand occurrences related to an event (D. R. Cooper et al., 2006). Doing interviews in case companies will allow us to explain and interpret various job characteristics employees face when working in a lean environment. Experiences from employees and managers on lean SME job characteristics will help in understanding lean job design, contextual barriers, and workers day-to-day lean experiences. A qualitative method (interviews) will allow us to successfully explore these experiences and provide insight that a survey questionnaire cannot provide (Longoni et al., 2013).

2.4.2 Defining lean companies

A lean company, although thoroughly researched, is not easy to define. There are many authors theoretically describing it, coming to the main conclusion it is about waste elimination (or at least reduction) and process optimization. Many works in the literature record the benefits of using specific lean tools. Some are very precise in defining those benefits (Ali Yame & Al-Werfalli, 2016; Arevalo-Barrera et al., 2019), and some generally conclude on them (Azizi & Aikhuele, 2015; Gonzalez et al., 2019). The choice of tools to use, however, remains on the company itself since the context in which it is implemented should be taken into account. When deciding which lean SMEs to include in the research, most authors quantitatively measure the level of lean implementation in an SME. Mainly, they give out a questionnaire consisting of several lean methods and tools and mark the amount used within a company. Several works so far have written down the most often used lean tools within SMEs (Alkhoraif et al., 2019; Hu et al., 2015; Pereira & Tortorella, 2018; Sahoo & Yadav, 2018; Yadav, Jain, Mittal, Panwar, & Lyons, 2019a), such as SMED, 5S, kaizen and Kanban. There are some authors that look at the degree of maturity of lean in the company (Tajri & Cherkaoui, 2015), and others divide lean implementation into stages and make the division of companies (lean beginners, in-transition lean, lean - Sahoo & Yadav, 2018). Some authors assess the level of lean with qualitative measures, namely interviewing managers or supervisors to check the companies' definition and understanding of lean management (Achanga et al., 2006). Our interest is predominantly in more mature lean companies, which have lean implemented for at least several years (we exclude lean companies with lean implemented after 2019). Choosing such companies would give us greater insight into actual job demands and resources first-line workers face in such context.

In this multiple case study, we included three lean SMEs from Croatia. We consider them lean since two conditions have been fulfilled: (1) the managers in interviews show good recognition and understanding of lean and its principles (both higher-level and line managers), and (2) the company has at least three out of four lean bundles implemented (any tool inside of each bundle). The lean bundles we used in this research are described in Table 9. Namely, they are just-in-time (JIT), total quality management (TQM), total preventive

maintenance (TPM) and human resource management (HRM) bundles. This categorization of lean practices was initialized by Shah and Ward (2003), and continued by other authors throughout the years (Ahuja & Khamba, 2008; Dow et al., 1999; Godinho Filho et al., 2016; Liker, 2004; Mirdad & Eseonu, 2015; Shah et al., 2008). By making this selection, we are certain that the companies chosen have lean implemented and are mutually comparable.

Before the interviews, we verified our inclusion criteria and present practices chosen SMEs use. Only including companies that have three out of four lean bundles implemented (at least one tool from each bundle) ensured comparability of the companies. The interviews included both managers and employees, and their main purpose is to identify various job characteristics (job demands and job resources) specific to each observed company. A detailed interview guide and questions are presented in Appendix 6. The data will serve as a basis for forming a JD-R model suitable for lean SME context. The total research data for interviews is shown in Table 11.

Table 11: Research data for interviews

Characteristics	**Research data**
Type of companies	Lean SMEs
Geographical area	Croatia
Data collection method	Interviews (face-to-face and phone)
Sample size	3 companies, 17 workers
Time frame	September – November 2022
Respondent profiles	Lean managers, supervisors, first-line employees

Source: adapted from Ramadas & Satish (2018)

2.4.3 Case selection, context and process

Since this research is about the worker outcomes in lean SMEs, our main criteria for choosing the companies aligns with the European definition of SMEs: „The category of micro, small and medium-sized enterprises (SMEs) is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million“ (European Commission, 2015).

We don't limit the research on SMEs that are mature in lean, but also expand it on enterprises that have only partially implemented it (only in specific units or organisational segments), since even a partial implementation of lean may be beneficial for SMEs (Dora et al., 2016; Rose et al., 2013). In LEs, however, it is suggested integrative implementation brings better results (Yadav, Jain, Mittal, Panwar, & Lyons, 2019a). Since our focus is on first-line employees, we made sure their department had lean implemented and addressed these specific units in our research. Table 12 describes the full inclusion and exclusion criteria for choosing organisations to participate in this research. We only include companies that implemented lean before 2020, so the workers and employees understand the methodology

well and have been using it for at least two years. This will help us clearly distinguish job characteristics (demands and resources) connected to lean.

Table 12: Inclusion and exclusion criteria for case selection

Inclusion criteria for companies chosen	– Fits into the EU SME definition (EU recommendation 2003/361, Article 2) – Has implemented lean methodology before 2020 – Different industry sectors included – Uses several lean tools, at least one from every lean bundle (defined by Shah and Ward, 2003) – Lean is implemented in at least one segment of business: it doesn't have to be implemented across the entire organisation as long as one unit has it fully implemented – and only that unit is considered when interviewing
Exclusion criteria for companies chosen	– Is not an SME – Has only a few lean tools; not all four bundles are covered – Company does not have lean implemented or lean is implemented after 2020

Source: own work

The results from qualitative research studies are considered to be more robust when the findings can be sustained (hold) in comparable but different settings. In this research, the focus is on lean SMEs, and additionally the interviewed companies all have a similar level of lean maturity: all three companies have more than 10 different lean tools implemented from the list we previously identified and presented. Brief summary of selected cases is presented in Table 13, and the summary of implemented lean practices in Table 14. Given that the three companies differed by industry type and production systems, we were able to examine different lean characteristics in different settings and make conclusions based on the immediate environment in which lean is implemented, and similarities of lean characteristics across industries and production settings. Conducting research on different industries can lead to a more comprehensive understanding of the worker outcomes in lean. However, there are unique factors and characteristics of each industry which may impact the findings (industry-specific factors), which we discuss in the findings. On the other hand, including different industries allows for generalizability of our findings, since we identify patterns which exist across industries. We obtained the data from three companies in different industries, to make sure the conclusions we make about job demands and resources are connected to lean and not specific to a particular industry. We first contacted the managers (or lean managers), introduced them to the study and secured their approval to participate.

Table 13: Cases selected for qualitative study

Company	Industry	Employees	Turnover (€, million)
A	Wood, furniture and paper manufacturing	154	21,5
B	Metals and metal products	203	19,5
C	Industrial, electric and electronic machinery	137	18,5

Source: own work

Company A is located in Istria, a well-developed region of Croatia. It is in the business of the production of corrugated paper and cardboard and paper and cardboard packaging, and it is considered an SME. By the time of the study, the company comprised 154 employees with an annual turnover of 21,5 million euros. The number of employees is mainly consistent throughout the past few years. Lean implementation began end-1990 with different tools implemented throughout the years, according to the CEO. For example, SMED was implemented in 2012, KPI tracking and OEE in 2018 and 5S in 2020. The company went through significant changes in ownership structure and management structure, with a most recent change in 2021, when they became a part of a new group. It has ISO 9001, EN ISO 14001, ISO 12647-2 and BRC certificates. Their focus is on producing sustainable packaging. The care for employees is shown through signing new collective agreements, with the most recent one signed in 2021, where they agreed on higher worker rights and wages.

Company B is a several decades old company taken over by a large manufacturing group in 1991. The company's main product is cast iron, and it develops, manufactures and distributes worldwide, a certified cast iron drainage system. At the time of data collection (September-November 2022), the company had 203 employees and an annual turnover of 19,5 million euros. The products are exported all over the world. Regarding quality management, the company is certified with ISO 9001, ISO 14001, and BS OHSAS 18001 certificates. The company cares for employees through continuous education, professional training, and investments in safety at work. It recently opened a new production facility and line, so its growth continues. Lean implementation started in 2016 and developed throughout the years. They hired a consultant for initial implementation, who, as they claim, brought a lot of theoretical and practical knowledge. Specifics of this company include a particular emphasis on tier meetings, where tier 1 are meetings of foremen in production with first-line employees, tier 2 meetings of these foremen with quality managers, and the levels move up to tier 5 meetings at the supervisory board level. The main problem-solving technique is with the A3 way of thinking tool, where employees suggest improvements and develop projects based on the suggestions.

Company C works in the production of refrigeration and ventilation equipment, except for household use. It is located in Samobor and is also owned by a large group. The company

consisted of 137 employees at the time of data collection, with a turnover of 18,5 million euros. It opened a new plant in 2019. Since the company produces custom-made products (such as high-tech air conditioning), they have a different process outline. It is also a subsidiary company with leading manufacturing group located in Germany. The initiative for implementation started from the mother company. The company implemented lean in 2019 with the primary goal of increasing production productivity. They hired an external consultant and started the implementation with the 5S tool.

Table 14: Implemented lean practices in selected case companies

Lean bundle*	**Lean practice (tool/method)**	**A**	**B**	**C**
JIT	SMED/Setup time reduction (cycle time reduction, quick changeover)	X	X	X
	Kanban (Pull production) (pull system, pull system production, kanban-system)	X		X
	Visual control (visual management, notification system, Andon)	X	X	X
	Lot size reduction (small lot sizing, Just-In-Time)	P	X	P
	Value Stream Mapping	X	X	
	Continuous flow		X	P
	Cellular Layout (cellular manufacturing)		X	
	Heinjunka (levelling the workload, level scheduling, production levelling)		X	
TQM	Kaizen (continuous improvement)	X	X	X
	Standardized Work/Process		X	X
	Poka-yoke (mistake proofing, error proofing)	X		X
	Quality management programs (total quality management)	X	X	P
	Jidoka (Automation)	P	P	
	Supplier-related practices (supplier involvement, supplier quality, lean supply chain)		X	
	Customer-related practices (customer involvement)		X	
TPM	5S (workplace organisation or 6S)	X		X
	Total productive maintenance (statistical process control, preventive maintenance)	X		X
HRM	Employee training and teamwork (people empowerment, workforce engagement)	X	X	X
	Employee involvement	X	X	X
	Cross-functional team (quality circles)		X	P
Connected practices	Six Sigma			P
	PDCA	X	X	

Note: P means the practice is implemented partially.

Source: own work.

2.4.4 Data collection

Interviewees who worked closely with lean methods and tools and were in front-line or supervisor positions for a minimum of six months were eligible for this study. We applied

purposeful sampling for recruiting interviewees. Snowballing was used to gather data on lean companies in Croatia. We had a list of exclusion criteria when selecting participants, excluding temporary workers and part-time and contracted workers since we assumed they do not know lean or organisational culture well. Also, workers and managers who do not use lean in their daily operations were excluded, or workers working less than six months at the current position. Participation in the study was voluntary, and participants were asked to sign consent forms with information about the study and their participation rights (in Appendix 2). Managers were introduced to research through the research project invitation letter (Appendix 3).

The interviews were based on a semi-structured interview guideline whose questions were reviewed and sorted into categories. I performed a pilot interview with a lean expert to receive feedback on the interview questions and protocol and a first-line employee to check whether the interview questions probed for the correct type of answers suitable for this study.

There were two sets of questions for two groups of interviewees. Since our focus is on job demands and resources for first-line employees, the first set of interview questions were focused on identifying JD and JR from their perspective and the second set of questions for management and their view of FLEs. Although the interview was structured, the questions served as core questions adjusted according to respondents' emphasis on topics and emergent themes throughout the interview. Respondents were asked to describe their usual working day, with questions that probed on job characteristics, emphasizing both good and bad segments of the work. For first-line employees, the first set of questions is aimed to understand the worker's role in lean and everyday operations. Following this, I prompted questions identifying job resources and demands and finding potential outcomes stemming from them. Management's questions consisted of prompts about their perspective on employee work in lean, and the job demands and resources they see for FLEs. At the end of the interviews, I asked respondents brief sociodemographic questions about their age, tenure, experience in lean, current work position, education level and type of contract (Appendix 4).

I additionally made observations when visiting case companies for interviews and collected on-site field notes of these observations to obtain information on company culture, production type and general environment. Visual boards and illustrations in meeting rooms and production lines offered information on the extensive use of lean and production tracking.

In total, this research contains 17 semi-structured interviews with participants from three companies. The interviews were collected in the Croatian language, and a bi-lingual author translated the questions from English to Croatian. All interviews were audio recorded, apart from one. They lasted around 50 minutes. One interview was done, writing extensive notes during interviewing. Interviews were repeated until data saturation was reached, that is, until no new information could be gathered regarding job demands and job resources in a lean SME context. While findings are specific to these cases, they may offer insights transferable

to similar lean SME environments. The audio recordings from interviews were transcribed using Express Scribe Transcription Software.

2.4.5 Respondent profile

The majority of respondents had only a high-school degree, except for managers with university degrees. The biggest challenge was to include shop-floor workers in the research formally through the case companies since removing them from their work positions means reducing the planned production outputs. Some of the first-line employees were contacted outside their work hours, and the contacts were provided by management. Participant data is shown in Appendix 5. We conducted interviews with four lean managers and 15 first-line employees.

2.5 Thematic analysis

Through an iterative process and discussion among researchers, I identified and refined codes, placing them in thematic clusters based on the JD-R model: job resources, hindrance job demands and challenge job demands in FLEs in lean SMEs. Each section presents findings identified across the three studied cases while also emphasizing case-specific conditions to illustrate variations. These findings are based on the studied companies and may provide insights transferable to similar lean SME environments. This thematic analysis contains solely our conclusions from the interviews. I relate these conclusions to theory in the discussion section. The qualitative research approach of this study has a deductive-inductive procedure, where I build the basis for the interviews on prior knowledge of lean implementation in SMEs (as used in Mojtahedzadeh et al., 2021). Even before the interview data collection, I had an idea of initial codes which capture themes derived from the literature and described in previous chapters. However, there was room for emergent themes and new codes. Reading and re-reading the transcripts, the data were organized through clustering into themes (challenge job demands, hindrance job demands and job resources). The themes that emerged only in a few respondents were excluded.

There is a difference in production type in all three cases. FLEs in case company B works in high-risk environments with a lot of noise and danger since they work with high heat and constant noise (foundry industry). FLEs from case company A work on the production track, with few workstation rotations, mainly doing the same type of work every day. Case company C doesn't have the typical production line; they produce custom high-value air-conditioning chambers. FLEs get specific tasks they have to fulfil during the work day. They get more variety and freedom in their work. Each product has custom specifications that workers need to familiarize themselves with.

2.5.1 Job resources in lean FLEs

Job resources for FLEs in lean SMEs include work experience, a good work environment and adequate work requirements, personal characteristics of workers, good business results, skills and expertise, training, and mentoring. However, a few resources stand out the most among all three case companies, resources that both FLEs and management see as beneficial, and they will be described in detail in the following pages.

JR1: Rewards and recognition

In lean, FLEs focus on personal benefits such as rewards and recognition. They are motivated by good business results, and they often mention being satisfied when they know their work for the day has been done successfully.

In the case of company A, the reward system is not mentioned as much among employees, so they don't connect contribution to lean ideas as something that would benefit them as well. Besides rewards, recognition is also very meaningful. FLEs take pride in the work they do and feel good when their work is recognized and engaged to do more:

> *The best thing is the final project when everything is finished and works great. When someone tells you, "Well done, you did it well", and then you are happy because no one objected to [your work]. (C, FLE)*

> *I think that the biggest motivator is the fact that when you do a good job, it is recognized. Today it is imperative to be a good manager, not only from the point of view of the director but also of the people who are in production, to know what motivates them. (A, lean manager)*

FLEs appreciate being listened to and knowing they can express their ideas. They understand lean through the rewards they get from it rather than having a wide picture of lean to see the benefits it brings to the whole company.

JR 2: Good work organisation

One significant benefit of lean is a greater organisation of the workplace and the whole process. It gives opportunities for FLE's voice to be heard.

> *Lean is always a very good thing. Since we introduced it, the company has made a lot of progress, and people also feel more satisfied because they can give their ideas on improving production. (C, FLE)*

Good work organisation is especially appreciated and recognized in companies organized in production teams (case company C), where the work is divided depending on the workers' knowledge and experience. They recognize that, after the introduction of lean, much less time is consumed searching for product parts, missing parts, etc.

Managers are aware it's up to them to create good work organisation. Case company C offers a good work environment (softer floors, karts to move heavy objects) and work organisation through clear, vertical communication (management - supervisors - FLEs) and organisational procedures. However, although it makes the work of FLEs easier, it's easy to fall into the trap of avoiding FLEs and overlooking direct communication with them, which may lead to missing out on good suggestions for improvements (as will be described later as a hindrance job demand).

JR 3: Experience/autonomy

When workers have a lot of experience, some autonomy is expected, even if workers consult with supervisors before making decisions. The more experience they have, the more autonomy they have, but the more they find other ways to finish a particular job faster because they know what the end product should look like and what is expected. They also feel responsible because they have experience.

> *Experience works. Practice is practice. You need to work so you can understand. The principle of work is completely different from the book. School is great, but you have to try something yourself to see how you'll make it easier for yourself. Some things are a lot easier with experience rather than going by the book. (A, FLE)*

JR 4: Support

Support emerges as an important JR among all shop floor departments in all three case companies. Most valuable and visible support is from immediate supervisors, but co-worker support is recognized and appreciated.

> *Your supervisor is always there for you to tell him that maybe something could be done better. Your ideas are respected. The supervisor really asks people. (C, FLE)*

Management views the support as an important motivator for workers to continue driving lean within the company. Management support is critical to maintaining continuity. It is provided through ongoing training and development and an organized workplace.

FLEs, on the other hand, recognize the support from their co-workers and immediate supervisors and less from management. When there is good communication and relations among workers, the job gets easier – for example, FLEs borrow the tools amongst themselves if the company doesn't provide enough. FLEs see support as help with specific work tasks and if their ideas are listened to by management. FLEs are more connected with supervisors since they are working together on a daily basis. They appreciate when supervisors make time for them and listen to their ideas or problems. They are also engaged more if they feel they have the support to solve problems on their own.

JR 5: Information management and communication

Information management refers to the way FLEs receive essential information about lean, production expectancy and potential changes and how communication is organized between levels. If the workers are adequately informed, they are liberated to do their job well. Management tracks the worker output through KPIs (case B and C) and prepares the rewards and recognition for workers accordingly, so workers know which part of the work is up to them and why they received specific recognition.

Communication is encouraged mainly formally through established processes (e.g., improvement suggestions forms in companies A and B). Even if workers try to offer suggestions informally, management pushes them to formalize their inputs to "enter the system" so everyone has adequate information. Receiving adequate information and clearly communicating changes in the organisation helps workers relax into their work roles.

JR 6: Other JR

Additional resources include the importance of a clean, organized work environment for FLEs, their involvement in production and the job variety they experience. FLEs mention the job variety makes the work interesting and motivating, especially when there are challenges. Regardless of lean tasks, if there is movement and changes in the workplace, the workers seem to be more satisfied.

FLEs appreciate a good work environment in the sense of a clean work space, warm conditions, adequate work equipment, good pay, and additional benefits they receive (food, covered travel expenses). This also includes good relationships with co-workers and transparent expectations from management. Management, on the other hand, considers clean workspaces and low physical demands good work environments.

If FLEs are involved in production planning, they feel more respected, seen, and engaged. They feel heard and more enthusiastic about work. Management sometimes doesn't recognize this, but they try to involve workers in continuous improvements, mainly formally, through improvement suggestions forms (company B and C).

Overall, identified job resources in lean SME FLEs are plentiful. The most prominent ones include good work organisation, good information management and communication (among FLEs and supervisors), support from co-workers and supervisors, recognition and rewards FLEs receive for their work, clean work environment, involvement of employees, experience and job variety. Table 15 describes the most frequent job resources in all three case companies, divided by viewpoints from management and FLEs.

Table 15: Research findings on job resources in lean SMEs

Dominant JR		Company A	Company B	Company C
Rewards and recognition	FLEs	– praise, good pay and job benefits are the most mentioned rewards – stimulation for improvement ideas is also empowering	– FLEs mainly work because of pay, don't mention other financial rewards	– praise, possibilities for advancement and good pay are important
	Mgmt	– monthly stimulation (variable pay) and KPI tracking for rewards – importance of praise and recognition	– financial rewards given to employees for successful A3 projects	– incentives for good ideas are motivating to employees
Good work organisation	FLEs	– working in an organized environment helps FLEs be organized at home – when they get certain tasks, it is up to them to organize in the way they think is best	– there are often meetings to discuss potential issues of the day – clear work instructions are available; they are especially important because of high-risk work	– weekly work plans, work is divided based on knowledge and experience, workers cover for each other – after lean implementation, everything is sorted and there are fewer mistakes, solutions are found faster, and there is a straightforward mistake-reporting process. Everyone knows what is their part of the job.
	Management	– clear KPIs in place to know the productivity of each segment – not so focused on creating a good work organisation for FLEs well-being	– hierarchical meetings (tier meetings) allow for good work organisation and understanding of worker needs for good production	– the goal of good work organisation is to promise realistic delivery dates for customers – lean improves worker organisational skills, and good work organisation motivates employees

To be continued

Table 15: Research findings on job resources in lean SMEs (cont.)

Experience and autonomy	FLEs	– FLEs mainly rely on experience to do the work – they don't use work instructions and adjust the work based on previous experience with similar production process – for bigger work issues, they rely on supervisors to help with solutions – FLEs feel they know the processes better than management and feel specific processes could be done better	– FLEs rely on experience to do their job well; it allows them to do the job quicker and with fewer mistakes	– issues are solvable through time, workers need more experience through a series of trials and errors – the dynamic environment and custom products make the experience more valuable
	Mgmt	– doesn't reflect on the experience or autonomy of the workers	– FLE contribution is expected, as well as high autonomy in the workplace	– official procedures should not be changed based on experience or any reason; processes should be done the way the company intended
Support	FLEs	– elders are expected to support young workers, but sometimes they don't show solidarity and are unhelpful – greater support from management than co-workers; in this case, they help in decision-making and meeting physical demands	– support from quality management is visible; there is open communication and daily meetings – lack of support from other departments makes the job more difficult (e.g.. technical department doesn't do their work)	– support from co-workers is meaningful, covering and helping each other, good atmosphere – issues in production go higher in the hierarchy, and management should solve them quickly so production can move forward – opennes of supervisors for sharing ideas means a lot to FLEs; they feel supported

To be continued

Table 15: Research findings on job resources in lean SMEs (cont.)

Support	Management	– first, management needs to support production managers and supervisors, then they will support FLEs in turn	– management needs support from higher instances (CEO supporting lean) so they can support lean in production and FLEs – each new worker goes through training and evaluation so they are ready for their work position	– offering support through training, education, and availability of resources – it is most important to offer adequate training to supervisors, so they can transfer it down to FLEs – all resources should be available for FLEs, and the work environment should be suitable so they are satisfied and can work as is expected of them
Information management and communication	FLEs	– FLEs are satisfied with communication with management, saying if they have issues, they can talk them out	– daily meetings are organized with immediate supervisors, which transfer the information further	– after lean, there are fewer questions about work; everyone knows their role and how to receive help if needed – there is good communication between management and FLEs
	Management	– regularly track KPIs to have information about progress – there are meetings held often with FLEs and announcements made available for everyone – there is regular feedback on FLE work, company news, progress, etc.	– insisting on formal communication of ideas to work on a problem systematically	– there should be no direct communication with FLEs, but rather through immediate supervisors, and that should be enough for all vital information to get transferred

Source: own work.

2.5.2 Hindrance job demands in lean FLEs

Hindrance job demands are most mentioned throughout interviews. There are many job aspects workers feel are stressful, and dislike about lean and work in general. These include monitoring, dependence on coworkers, mental and physical demands, lack of motivation, worker fluctuation, limited autonomy, work pace requrements and no work variety. There are a few hindrance job demands, however, which stand out as most stress-inducing in FLEs in lean SMEs, which will be described below.

HJD 1: Inadequate lean understanding and lean expertise

In company B, although they are introduced to lean methodology, FLEs still see lean as "something to write your opinion down" or "tracking of working hours":

> *Lean is a record of work hours, as far as I am concerned. That means the number of moulds made per hour throughout the day, stoppages, and accompanying stoppages... (B, FLE)*

> *Lean is good for workers to write down their opinions, say what they need and which problems they have, so then that needs to be solved. (B, FLE)*

This perception may stem from the focused view of the production since FLEs only see that first-line part of lean. Many FLEs work with lean tools but don't realise it's lean. Some don't even recognize certain workshops and education in the company are connected to lean. The workers that do understand lean view it as a method of correcting mistakes - a series of trials and errors to bring the process to perfection:

> *We had workshops where we raised [the process] to some standards and now we are trying to maintain it. In my opinion, lean works by mistake. We said this is going to sit there, but we figured it's better here, that's the error method. Over time, you find out if it's good or not, and then we redo some things. It's one thing on paper, and it's another [on the shop floor]. (C, FLE)*

> *If I understood it correctly, it means arranging the processes so that they function better, with higher efficiency, and productivity. From the arrangement itself to the end result. I think there are good things [in lean], there are some ridiculous requirements here and there. It's not that it's bad. It works. (C, FLE)*

This misunderstanding of lean, although workers don't recognize it as such, may lead to stress as it's perceived as an additional workload.

Management doesn't see the need to introduce lean to FLEs properly, so FLEs sometimes don't cooperate when it comes to lean tasks. It appears management doesn't view them as crucial for maintaining lean in the company. One company from our study (B) seems to think workers do not need to know the ultimate goal of lean nor the whole lean picture, just how

to work with the tool. The other (C) informs the workers on the 'why' they are doing an activity or a task.

> *We look at that lowest level, and we try to make the worker understand, but basically, we try harder to create a routine. When he creates a routine, only understanding will come through the routine. (B, lean manager)*

Ultimately, workers in company C seem a lot more motivated to do the job, and a lot more aware, not just of their work, but of others as well, and how it all ties together. If the workers don't get adequate knowledge of why they have to do certain things, they refuse to work. This results in a general lack of interest in lean, and initial resistance to change since workers don't understand the change well. This, in turn, hinders employee results and company progress overall. Ironically, lean managers emphasize the importance of FLEs in lean systems, claiming their involvement is crucial for successful lean results.

> *Lean is a system that is based exclusively on people, and that means people on the shop floor who do the work. I think that when we succeed in this, when we fully gain people's trust and when they feel the benefits on their skin, then I think that we, as a company, will also experience a boom and see from the financial side some benefits that maybe a few years ago we could not even have imagined. (B, lean manager)*

HJD 2: Cultural changes/changes in organisational climate

Instilling a lean culture among workers is very important so that they truly understand why they are doing certain actions. Otherwise, management is always going to have to push lean onto workers, instead of FLEs taking the lean initiative.

> *FLEs would falter because no one is forcing them anymore. "Nobody asks me that anymore, so I don't even have to do it". And I think that most of the fights are about that - maintaining continuity. It has not fully taken root, the lean culture. It's not so natural and I guess it's not so easy to grasp, so we push: "Come on, come on, come on". (C, lean manager)*

> *To keep it constant, that is where we are deficient. I think that behind it all lies our standard mentality. We are deficient here, we constantly need to work with people to keep it at some level. We need to work with people as much as possible to keep as much under control as possible. And that takes time and work. (C, lean manager)*

Commitment to continuous improvement varies across departments since some workers readily accept the changes, while for others, it takes some time. Management needs to find ways for resistant FLEs to accept lean. For example, unmotivated workers don't care whether problems in production are solved or not. They just do their job and what is required of them regarding lean. On the other hand, workers with high responsibility try hard to incorporate lean in their work, caring more whether their ideas are implemented or not.

> *I can say 50% of people follow [lean], and the other 50%... There are more responsible people, be it supervisors or FLEs, who follow the procedures, but the remaining 50% need*

work - put this here, and there, they have 5S implemented and maintained, nothing else. (B, lean manager)

When there is a competitive environment with clear rewards for improvement ideas (company C), the workers are ambitious about offering ideas for improvements. If the company doesn't have clear, motivating incentives for lean ideas (company B), but lean is just a part of the job, workers are not motivated to change the company culture and offer their ideas for process improvements.

Generally, if not explained properly, FLEs do not care about lean as a methodology. Some want to pick up the paycheck, do their job well, and go home. The main incentive for newly employed FLEs is good pay. If they are not happy with it, there is less chance they will adopt the lean philosophy, because they are not motivated from the start. There is a balance between initial expectations and low pay from the worker and the need from management to see if it pays off to invest in a certain worker. If a company does not have a properly established accountability system, a lean mindset does not develop.

Supervisors are quite frustrated because they use tier 2 boards where they present problems that need to be solved, but workers responsible for solving these problems often do not do their part because they are not accountable and do not have sanctions. (B, lean manager)

If there is significant resistance and the mindset shift does not happen, there are important mental well-being consequences for workers. For example, management does constant monitoring/supervision of FLE work (through time displays) to attain information for improvement. FLEs view that in a negative light. If they don't fulfil the tasks on time, they resort to excuses and justifications for why the work wasn't done on time. It can go to extremes: one worker could not adjust to 5S lean requirements, so he quit his job. Changing the mindset can be challenging, but it is possible.

At some point, people become aware of how important it is. That change did not happen right away at the beginning, but FLEs started to observe their workspace and have the need to be orderly and have things sorted. They are aware that this makes their work easier. Through pull, people become even more aware that the 20th of October is the 20th of October and we don't have a lot of space left and right, as it was before. (C, lean manager)

It still depends on what kind of character people are, that you need to find a way to get closer to them, how to explain to them so that they somehow accept it. Because it is important that they feel that it is good for them too. (C, lean manager)

HJD 3: Problems with information flow (including lack of communication)

Several workers mentioned it is very stressful when there are sudden changes in the process that they do not understand. They feel the process becomes chaotic. If the workers don't understand why a certain change is happening, even on a daily level, they are not satisfied. When workers are well-informed, they seem to be more aligned with the goals of lean.

[Process requirements] change and no one explained how it changes. Just "boom", and now you suddenly get something that you have never seen in your life and you don't know what to do with it. Then you call, but they do not answer. Then you send e-mails, but they do not answer and so on... Also, some extraordinary situations. You can't predict them, so there can be a bit of stress there. You were thrown into the fire, and no one told you how. Find out [on your own]. (C, FLE)

Our problem is that when some projects are not explained once they come. Then, through previous experience, we somehow come to an idea of how it should be. I think that some new things like that should be explained in black and white. If there is something new, you have to [mention how you want me to do] it. Otherwise, I will do it as I know. It is not written in the project, I don't see that you wanted something different. (C, FLE)

There is mainly no direct communication between managers and FLEs; it goes through supervisors, even in SMEs. Management insists on communication staying formal, especially if it is about improvements and ideas so that everything "goes through the system" and is formally recorded. Lean managers claim there is a higher chance an improvement will be done if it goes through formal information channels. Therefore, FLEs don't get many opportunities to express brief, fleeting ideas. They are instead encouraged to think an idea through and thoroughly develop it, and when it has been formalized and implemented, the FLE receives an award for their contribution.

Management recognizes FLEs feel stressed due to poor communication and information management. Communication between top management and FLEs and between departments is poor. On the other hand, communication with immediate supervisors is satisfactory, and it happens daily in lean. This may be the reason communication occurs both as a stressor and a motivator.

When we started with pull, the time frames became more precise. Stress is then created, which is somehow logical. If newer things are more frequent, it also creates stress because new things can be a little more difficult to do. Also perhaps deficiencies in documentation or poor communication between departments. Yes, the lack of information... If I do not have the correct information - now find out whom to contact, this and that... There must be real information and real documentation so that they can continue to work. (C, lean manager)

There is a difference between workers working for a longer time in the same company and newcomers. The ones working for a longer time don't see areas for future improvements but claim they could offer their knowledge to younger generations. Younger workers see areas for personal progress and improvements, and have a hopeful attitude towards future work. They are more open to learning new things. Older FLEs just "go through the motions", doing the job they have learned, and they think they know the job better than management, but often feel management doesn't listen to them or their ideas.

You try to explain your idea, and then they initially say yes, but do their own thing. But most of the time, what they envision is done. I am not young and green, you do as best and as much as you can so that everyone is satisfied at the end of the day. (A, FLE)

Many times, you have a vision. Something could be much easier and simpler, but your hands are tied. The supervisors have their supervisors, and they make decisions, so it's not easy. (A, FLE)

Some even "gave up" on giving ideas and contributing to continuous improvements because of that and just did the work they were told to do. This is especially prominent when there are significant management changes inside the company. FLEs are also discouraged when they propose ideas, but management refuses them.

Sometimes there are ideas that we think are good, and someone else above us doesn't. Then we feel deprived. We grumble, but we agree, essentially, with what the company thinks. We can give our advice because we are down "in the fire". If someone thinks that the idea is bad and you think it's good, you can't go any further. If someone above you has decided that it is not something, then it is not something. A little frustration occurs. But you will find another idea, and it will pass. (C, FLE)

HJD 4: Limited availability of resources

Management recognizes financial constraints that prevent attaining new machinery, providing tools for everyone, etc. They mostly don’t see it as a hindrance to workers. FLEs, on the other hand, recognize the limited availability of tools they work with. They get frustrated when they have to improvise often due to a lack of tools. Borrowing tools between departments, fending for themselves, especially when tools need repairing, is often the case. FLEs mention that managers react slowly to their requests for additional resources, which further causes frustration.

Limited availability of resources may refer to a lack of workers on the front line, or machinery to support customer requirements. For example, in case B a complete preparation for printing out a specific product has to be disassembled because there is a new printing job requirement from management. This frustrates and exhausts workers, especially if they don't know the reason behind the change.

It can be a lot of stress sometimes daily. Problems and sometimes extraordinary situations due to unexpected processes. Well, sometimes a little with people and so on. It is not very easy. (C, FLE)

To stay lean, we combine a lot of things so that one person does several jobs. It creates a lot of pressure on the person. (A, manager)

Finally, hindrance job demands that we can identify from interviews include inadequate understanding and expertise in lean from FLEs, problems with information flow (including lack of communication between departments and vertically from FLEs to management and

vice-versa), limited availability of resources, changes in organisational climate (cultural changes). There is also evident management ignorance of the contribution of FLEs to lean improvements. Table 16 describes the most frequent hindrance job demands in all three case companies, divided by viewpoints from management and FLEs.

Table 16: Research findings on hindrance job demands in lean SMEs

HJD		Company A	Company B	Company C
Inadequate lean understanding and expertise	FLEs	– workers do not recognize they are working with lean tools, although they use them daily (5S, Kaizen...)	– FLEs do not realize some of the things they do are considered lean; they don't understand the connection between lean workshops and shop floor work – lean was perceived only as additional workload until results started to show and some time passed	– there is frustration if the process is changing and it is not explained properly – some parts of the job require specific skills (e.g. electrician), so there is limited support because other workers do not have this skill set – because of inadequate knowledge, workers have no job rotation, which may cause a lack of focus and increase mistakes – if FLEs get an improvement idea, they do not realize it is a part of lean
	Mgmt	– management does not seem to think workers need to understand the lean philosophy, understand the tasks they are given	– management turns a deaf ear when workers request additional help – claim knowledge about lean depends on the mindset and openness of workers	– limited lean knowledge leads to frustration due to misunderstanding of the purpose of lean, also because lean initially brings problems to the surface
Cultural changes/changes in organisational climate	FLEs	– some colleagues are willing to help, others do their work – the more positive workers act as mentors for new arrivals since the others are not willing to help – issues with interpersonal relationships in departments cause stress – negative climate in the company since management changed a few years ago	– communication among workers could improve, it is still not on a satisfactory level – workers feel management is lying to them about potential improvements (a lot of promises which do not come to fruition) – FLEs feel their hands are tied when it comes to making decisions on the shop floor, mainly because of the mindset (“I am here just to do the work, not make decisions”)	– many different opinions and attitudes among FLEs, so it's difficult to coordinate everyone – gap between older employees and younger workers, where older do not accept changes easily – personal characteristics play an important role, whether employees accept changes easily or not, whether they are naturally tidy, etc.

To be continued

Table 16: Research findings on hindrance job demands in lean SMEs (cont.)

	Management	– there has been resistance from FLEs due to management change – management still sees the culture of justifying mistakes in FLEs, instead of trying to learn from them for the future	– there is a lack of accountability in key persons (supervisor level, for example) which frustrates all the other FLEs – high worker fluctuation and many foreign workers in the company so the culture is changing and varies – there is still a lot of work for FLEs to accept lean culture fully, at all levels. The acceptance varies depending on the personality of the person.	– big cultural changes after lean was implemented: employees had to expand their knowledge, add additional tasks to their day, communicate amongst themselves more – there is higher awareness about deadlines and urgency of certain product deliveries – initial resistance to change was inevitable, more so with older employees, but FLEs got through it through time – tradition is difficult to overcome. It's also difficult to maintain consistency because the mindset is difficult to shift.
Problems with information flow (including lack of communication)	FLEs	– FLEs feel there would be less waste if they gave attention to their ideas regarding the products, but they feel management is not interested in their opinions, so they only do the work that is required – there is poor communication between management and FLEs	– FLEs ask for help and feel as though management pushes the problems "under the carpet", avoiding communication	– new projects are not explained properly to workers, which causes time loss and frustration since they try to solve some things through experience – even if there is available documentation, there are errors which FLEs have to correct
	Management	– there is some poor communication between levels, the company needs to work more on management communication towards FLEs	– mainly focus on communication and education of immediate supervisors	– there is weak communication among departments and some faulty documentation – if there is a lot of novelty in a certain department, that can create issues since it is not communicated to FLEs on time – specifics of custom-made products means there is sometimes a lack of information about proper procedures, which can cause stress among workers

To be continued

Table 16: Research findings on hindrance job demands in lean SMEs (cont.)

Limited availability of resources	FLEs	– workers have to fend for themselves and borrow tools from other departments for certain tasks – FLEs have to improvise often, lean on experience, and sometimes just accept the machines they are working on are old and worn out – the management reaction to lack of resources is sometimes slow, where they offer help but don't deliver it on time	– FLEs don't think there is a lack of physical resources (tools, etc.) for work – there are big sources of stress due to poor organisation, where workers do their work diligently, but support (for example, technical) doesn't help when needed, which causes stress	– if there are machine issues, the work schedule of a worker is disrupted, which causes frustration – FLEs are satisfied with the tools they have, but they rotate them between departments often since there is not enough for everyone. This is a problem especially when some of the tools need repairing. – sometimes there is work overload in one department so workers have to transfer for the day, and sometimes there isn't enough work so FLEs are sent home only to be invited to work Saturdays instead (elements of mura and muri) – FLEs have to cover other workers
	Management	– acknowledges there is old machinery, but also recognizes the current financial situation doesn't allow for new machines	– there are financial constraints in the company	– doesn't mention lack of resources as a hindrance

Source: own work.

2.5.3 Challenge job demands in lean FLEs

CJD 1: Challenging work

The mental demands FLEs experience in lean SMEs include changes that occur with lean. Both management and FLEs agree that no mistakes can be hidden on the shop floor since everything is visible and easily traceable, so there are no secrets.

> *You can't hide some things, as I said. Everything is visible here. You did it, or you didn't; there is no third, no grey area. Black and white, that's how it is. (C, FLE)*

> *It turns out in the end that in production, people hide things a lot less than maybe elsewhere, if we're being honest. (C, lean manager)*

However, the problem with implementing lean is that it opens a can of worms: lean tries to solve one problem but then it also shows there are many other problems following.

> *A lot of problems come to light. You solve some problems, but then, actually, a lot of new ones just become visible. (C, lean manager)*

CJD 2: Production responsibility

Demands and expectations from managers are high for FLEs. They expect responsibility and commitment to continuous improvements.

> *[I expect] responsibility, that they are not afraid to propose new things and that together with them we build a culture of continuous improvement. (B, lean manager)*

> *[We expect the FLE] to do the tasks that are set before him to the best of their ability, and yet on the other hand, that they feel comfortable. It is partly up to us and him. To complete tasks and continue to contribute to improvement. The goal is to give an even better-quality product with his ideas. I think it is important for us that we have that feedback, that the improvement can generally be seen through all these results, orderliness, cleanliness... (C, lean manager)*

FLEs have responsibility in production, especially during night shifts when there are no supervisors. They say it can get stressful, especially if they have unique knowledge that no one can help with, so they are responsible for doing their part well and being knowledgeable. Management then relies on them to make important decisions.

> *I have accumulated [experience] over time. For example, in the afternoon and at night, we are alone without supervisors. Then you decide on your own what you will do, whether you will start a certain job at all, whether is it even worth doing it, or if you are wrong, do something else, and so on. I am responsible for all that work, for those boxes, which are, after all, money. (A, FLE)*

Management, on the other hand, doesn't view it as stressful. Some workers are given A3 lean projects to work on (in company B) and get more authority after lean implementation. They claim lean has brought clear boundaries on what is the worker's responsibility and what falls under management's responsibility. They say it is a challenge to maintain the feeling of production responsibility in workers and keep the lean continuum.

CJD 3: Problem-solving

If there are issues, it is expected that FLEs immediately alarm the supervisors. FLEs often have to think quickly on their feet, which can be very stressful. In this case, experience comes in handy and makes problem-solving easier. In company C, FLEs agree that problem-solving is much faster and more efficient after lean implementation.

In conclusion, based on the interviews in three case companies, challenge job demands that appear among FLEs in lean SMEs include production responsibility, problem-solving, challenging work and the need for mindset change. Table 17 describes the most frequent challenge job demands in all three case companies, divided by viewpoints from management and FLEs.

Table 17: Research findings on challenge job demands in lean SMEs

CJD		Company A	Company B	Company C
Challenging work	FLEs	– there are problems every day which make the work challenging (e.g. machine breakdown) – you need to be focused 100% on what you are doing to avoid mistakes	– the work is challenging on its own because of the type of business (foundry), so there are safety aspects and a high-risk environment	– lean made the challenges easier – there are often unexpected situations FLEs have to solve – some departments have more challenging work (electricity vs. assembly)
	Mgmt	– doesn't mention challenging work	– currently the company is results-oriented instead of process-oriented, which can be challenging	– it can be challenging when there is a tight timeline for production and if there are some bad instructions or a lack of information
Production responsibility	FLEs	– workers have the responsibility to stop production if there are issues – especially stressful if they are in the role of a mentor where they have to monitor newcomers and share their responsibility – the responsibility is high, especially during the night shift when there are no supervisors – FLEs say management asks questions after there have been issues, and the workers are the ones who need to think on their feet to save money for the company	– there are certain parts of production where FLEs have production responsibility, especially if they have unique knowledge related to their workplace – there are two types of workers: responsible ones you can count on, and some that just do basic 5S and don't want to do more	– if the shop floor is in a rush, there is no one to help, so they have to be responsible for their work, with little room for mistakes – if they have unique knowledge, management relies on them to make important decisions since they are more apt to make them – after lean, there is a clear line of responsibility between FLEs and management – FLEs shoulder responsibility by experience – big responsibility during the night since there is no supervisor then.
	Mgmt	– doesn't mention PR	– each worker is expected to carry out an A3 project – FLEs were given more authority after lean – they are expected to show responsibility and be active in continuous improvement	– it is a challenge to keep the lean continuum, for the workers to constantly feel the production responsibility for their parts – there is a strictly standardized way of doing things, and workers shouldn't try to go around it

To be continued

Table 17: Research findings on challenge job demands in lean SMEs (cont.)

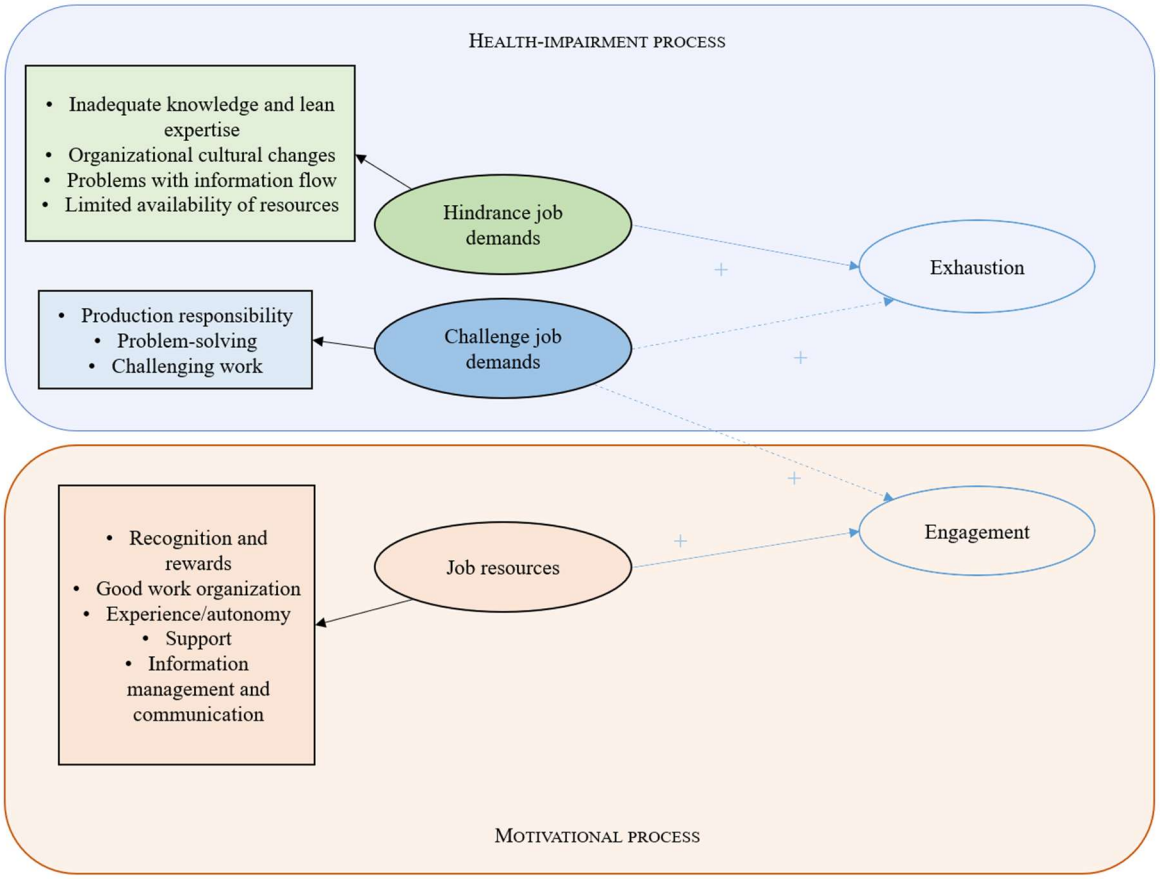
Problem-solving	FLEs	– if problems occur, FLEs should notify supervisors – FLEs try to solve problems on their own, they have to fix issues quickly so the production goes forward – problems are solved through experience	– have A3 projects they are working on	– after lean implementation, the problem-solving is much faster and easier – workers can offer solutions for problems, but they have to be discussed with supervisors before implementation – experience is a great contributor to easier problem-solving
	Mgmt	– different jobs in FLEs require different levels of problem-solving skills – initiative in problem-solving is expected of workers	– there is daily problem-solving, if there are emergencies every other job is put aside, majority of the time day doesn't go as planned	– problem-solving is not as required from workers since they have clear instructions for their job, but if they see issues, they should contact their immediate supervisors to solve the problem

Source: own work.

2.6 Discussion

This chapter verified the various job characteristics FLEs face when working in lean SMEs. They are discussed and divided into job demands (energy-depleting) and job resources (motivating job characteristics). We further elaborate the theoretical findings on the role of FLEs in lean SMEs, mapping worker outcomes and exploring the impact of identified job demands and resources on worker outcomes: exhaustion and work engagement. We adapted and upgraded the theoretical JD-R model to explain the lean SME environment through qualitative analysis and interviewing FLEs and managers.

Figure 7: Empirical findings: job demands and resources in lean SMEs (JD-R Model)



Source: own work.

2.6.1 Discussion on job resources

Management and FLEs agree that support and communication between management and co-workers are essential. In our study, formal communication practices—such as regular feedback on FLE work, daily meetings, formal communication of ideas, and the clear assignment of job roles—were identified as key job resources. Lean SMEs, despite their flat organisational structure, often rely on structured communication channels that mirror the

formalised procedures found in large companies. For example, managers insisting that FLEs' continuous improvement ideas pass through formally developed channels ensures process consistency and supports sustained improvements (Knol et al., 2019). This structured approach enhances role clarity and reduces ambiguity, thereby increasing employee engagement and facilitating lean transformation.

FLEs value good work organisation, which they feel comes with lean implementation. Compared to non-lean SMEs, where workflows may be less standardized, lean SMEs emphasize structured processes that reduce confusion and enhance efficiency. Large firms also implement structured work environments, but they often have more rigid systems and bureaucracy, whereas SMEs benefit from greater agility in adapting lean practices. Good work organisation reduces FLE confusion and frustration and facilitates clear communication among workers and managers (O. Jones & Macpherson, 2006), reducing the risk of errors and misunderstanding.

Rewards, recognition, and communication were also recognised as job resources in lean SMEs. Providing rewards, recognition, and communication, among other things, form a part of soft lean practices (Mamat, Deros, et al., 2015), which creates higher employee participation (Dombrowski & Mielke, 2014; R. Jones et al., 2013) and lowers the level of disengagement among workers (Scanlan & Still, 2019), which results in positive worker outcomes from those job resources. Recognition is essential since it motivates the worker to continue improving. In large companies, formalized reward structures and performance evaluations often dictate recognition, whereas in lean SMEs, recognition tends to be more immediate and personal, fostering a stronger sense of involvement. Non-lean SMEs may lack structured recognition processes, leading to inconsistencies in how employees feel valued.

To perform effectively, workers must have responsible autonomy and work facilitation (Angelis et al., 2011). When management provides autonomy, combined with the job experience, FLEs feel motivated and engaged in their work (Dijkhuizen et al., 2016). Besides being autonomous on the job, receiving support from management and colleagues additionally increases work motivation and may serve as a buffer for reducing the demanding aspects of the job. Without proper support, workers in these organisations may feel overwhelmed, stressed, and exhausted (Pankotay, 2020). This may negatively impact their well-being, namely job satisfaction, productivity, and employee retention (Vassos & Nankervis, 2012). Therefore, management and co-worker support can mitigate stress and reduce worker exhaustion. Companies can help employees feel more engaged, motivated, and committed by providing a supportive work environment. Continuous support sustains the continuous improvement philosophy among workers (Netland et al., 2015).

SMEs should focus on increasing communication and providing appropriate and timely information to FLEs to create a more favourable lean job design. While lean SMEs recognize the benefits of worker autonomy and structured job design, they have not entirely succeeded

in implementing these aspects. In large companies, autonomy is often constrained by hierarchical decision-making, while non-lean SMEs may not systematically delegate responsibilities due to a lack of lean structures. Lean SMEs have the opportunity to bridge these gaps by balancing structured processes with flexibility, ensuring FLEs feel both empowered and supported. Workers are willing to participate in lean and feel motivated when they work in a clean and organised work environment, when their work gets recognised by management, and when they have direct communication between themselves and management. Implementing lean has the opportunity to create a motivating environment for the FLEs (Marin-Garcia & Bonavia, 2015) by transferring tasks and responsibilities to workers and giving them autonomy (Bouville & Alis, 2014), which is something lean SMEs recognise but have not entirely been able to carry out.

2.6.2 Discussion on hindrance job demands

FLEs usually work in low-qualified jobs with low pay, so managers face an additional challenge to motivate them and increase their job satisfaction. Although FLEs get particular education about lean, they generally do not understand the reasoning behind it – why they are doing specific actions and the end goal behind them. They do the lean tasks but do not understand the philosophy. This contrasts with large firms, where structured training programs often provide a more comprehensive lean education. In non-lean SMEs, on the other hand, lean training is generally absent altogether, resulting in even less awareness of continuous improvement principles. The limited understanding of lean in SMEs may stem from their short-term operational focus (Ates et al., 2013; Knol et al., 2019), and there is no time for FLEs to invest in workers and introduce the whole philosophy properly. There is a discrepancy between long-term improvement efforts and daily operating routines (Knol et al., 2019).

Our findings also revealed aspects of information flow that function as hindrance job demands, namely informal communication to be lacking in lean SMEs. We found poor communication practices, including management's lack of interest in FLEs' ideas, poor communication between organisational levels, avoidance of direct interactions with FLEs, an exclusive focus on supervisors, and the failure to present new projects to FLEs. These informal or deficient communication practices impose additional strain on employees by reducing their access to timely and relevant information. According to the JD-R model, such hindrance demands may undermine motivation and performance, ultimately leading to higher stress and potential burnout (Bakker & Demerouti, 2007; LePine et al., 2005).The resistance to change from FLEs may come from a lack of understanding of the changes made and because of the complexities implemented methods bring (Castillo, 2022). Insufficient knowledge of lean proved to be one of the hindrances to successful lean implementation (Shang & Sui Pheng, 2014) and is considered one of the issues preventing effective health and safety improvements in companies (Abu Aisheh et al., 2022).

FLEs identify poor planning, organisation, and limited availability of resources as job stressors that negatively impact their work and well-being. Poor planning could lead to last-minute changes in the production process, disorganized workspaces, and increased stress. In contrast, larger firms often have more structured production planning, though they may struggle with rigid bureaucratic processes that limit flexibility. Non-lean SMEs, by comparison, frequently face inefficiencies due to the absence of standardized procedures. Poor communication has already been defined as one of the job stressors specific to SMEs (Lai et al., 2015), alongside quantitative workload, job insecurity and poor promotion opportunities.

A critical issue in lean SMEs is the limited availability of resources, which hinders efficiency. Unlike large firms, which generally have more capital to invest in tools and technology, SMEs often operate under tighter financial constraints. Non-lean SMEs may experience similar resource limitations, but they lack lean's structured problem-solving approach to mitigate these challenges. In lean SMEs, FLEs – who work directly with the final product – are often the first to notice inneficiencies and defects. Managers however, tend to focus on broader operational strategies, leading to a disconnect between frontline workers' experiences and management's perspective. In our analysis, limited availability of resources refers to the lack of necessary tools or materials required for efficient task execution. Since FLEs work directly with the final product, they identify operational gaps that management, with a more high-level perspective, may overlook. In our analysis, limited availability of resources is categorized as a hindrance job demand because it actively creates obstacles that disrupt workflows, elevate stress levels, and diminish well-being. Unlike a mere low level of a job resource—which would imply a passive deficit—this factor forces FLEs into reactive adjustments, increasing role ambiguity and work strain. Our qualitative findings confirm that FLEs experience this as a significant barrier, aligning with the JD-R framework's differentiation between job demands and job resources. Thus, limited availability of resources should be understood as an active hindrance that negatively impacts performance and well-being, necessitating targeted interventions beyond simply increasing resources.

The demands and resources workers experience are characterised by the culture in which they work (Lopez-Martin & Topa, 2019), and organisational culture affects the level of success lean has in a company (G. Harris et al., 2014; Jayamaha et al., 2014; Loyd et al., 2020). For lean to succeed, shop floor culture must align with the overall organisational culture (Losonci et al., 2017). Unlike large companies, where lean principles are often embedded into corporate training programs and standardized across multiple sites, lean SMEs frequently struggle to instill lean thinking at all organizational levels. Since lean represents a systematic way of thinking, employees must go through a mindset shift to make adequate moves for improving processes (Bagley & Lewis, 2008). Managers in lean SMEs emphasize that without continuous reinforcement of lean practices—such as maintaining organized workspaces and following lean procedures—these principles quickly fade into the

background as employees prioritize immediate production demands. This highlights the need for sustained managerial support to maintain lean momentum.

Additionally, SMEs often face resource constraints that make lean implementation more challenging than in larger organizations. Large firms may have the budget to fully integrate lean across departments, while SMEs are more prone to partial lean adoption—where only select lean practices, such as process optimization, are implemented without embracing the full philosophy. This incomplete adoption can have unintended consequences, including increased job strain and reduced job satisfaction. When lean is only partially implemented, workers may face additional pressures without experiencing the intended benefits of improved job autonomy and engagement. Therefore, an incomplete lean implementation alongside a lack of resources may result in low employee job satisfaction and health (Bouville & Schmidt, 2019; Landsbergis, Adler, et al., 1999).

2.6.3 Discussion on challenge job demands

FLEs, who thrive on variety and challenges in their work, need to develop a certain level of awareness and self-awareness to be able to reflect on their day-to-day activities and connect them to lean (Moyano-Fuentes & Sacristán-Díaz, 2012; A. D. Smith, 2010). Unlike employees in non-lean SMEs, where job roles may be more rigid and task-oriented, FLEs in lean SMEs are encouraged to actively engage in continuous improvement. However, the extent to which they embrace this depends on the level of lean maturity within the company. In large firms, lean practices are often more structured, with dedicated problem-solving teams and formalized training programs that reinforce the connection between daily work and lean philosophy. In contrast, lean SMEs may struggle to provide the same level of structured training, making it harder for FLEs to fully internalize lean thinking.

Lean not only increases productivity but also introduces challenges (de Treville & Antonakis, 2006; Marin-Garcia & Bonavia, 2015). When FLEs are engaged in problem-solving and interested in improving their workflow, they are more motivated to enhance their production output and competitiveness (Seppälä & Klemola, 2004). However, in SMEs, this engagement often relies on informal, experience-based learning rather than systematic lean training. In large organizations, structured problem-solving methodologies (e.g., Six Sigma, Kaizen events) provide employees with clear frameworks for tackling issues, whereas lean SMEs may depend more on individual initiative and on-the-job learning.

FLEs in lean SMEs have responsibility over their workplace. Employees are expected to anticipate, prevent, and solve production problems that may arise (Beraldin et al., 2019). Unlike large firms, where responsibility for problem-solving may be distributed across multiple roles (such as quality engineers or continuous improvement specialists), lean SMEs expect frontline employees to manage issues directly. This means FLEs must address equipment malfunctions and production inconsistencies in real time (Huo et al., 2019). These challenges may be intrinsically exhausting but may foster work engagement since FLEs

satisfy the need for autonomy and competence (Van den Broeck et al., 2010). In contrast, non-lean SMEs may not encourage employees to take such ownership, which could limit both engagement and opportunities for skill development.

Since the basis for lean are highly skilled employees who can think creatively and solve problems (Kosuge et al., 2009), their active participation is necessary to achieve continuous improvement in the company (Jorgensen et al., 2005). However, SMEs often face challenges in providing the necessary support to sustain this participation. While large firms may have dedicated training programs and structured feedback loops that integrate employee insights into decision-making, lean SMEs must often rely on informal mechanisms to involve workers. Ensuring that FLEs' input influences management decisions is crucial, as this directly impacts the success of lean initiatives Dombrowski et al., 2012).

To maximise the benefits of lean, SMEs should focus on creating a lean job design that encourages FLEs to take responsibility for the production line and actively solve problems on the front line. However, it's crucial for management to provide adequate support to mitigate the risk of exhaustion that active participation may bring. Unlike large companies, where structured lean systems help balance employee workload, lean SMEs must be especially proactive in maintaining a supportive environment. Without proper support, the expectation for continuous engagement may lead to burnout rather than sustained motivation. By integrating both autonomy and adequate managerial support, SMEs can create a work culture where FLEs feel empowered rather than overburdened, ultimately strengthening their commitment to lean principles.

2.6.4 Different viewpoints between managers and FLEs

There are significant differences in the perspectives of management and FLEs on what is crucial in a lean environment. They do not identify the same motivators and stressors that are deemed important by FLEs. The disparities stem from the distinct viewpoints each side holds. While management concentrates on the 'big picture' and long-term lean success, FLEs focus on the 'ground stuff', such as the work environment, conditions, or the climate among co-workers. Managers often overlook the atmosphere on the shop floor, focusing solely on what they offer to FLEs. This finding aligns with Vienazindiene and Ciarniene (2013), who argue that a focus solely on tool implementation, without considering staff problems and needs, leads to lean failure. Therefore, disregarding FLEs' understanding of lean could lead to severe consequences for lean in the entire company, underscoring the urgency of this issue. Unlike in large firms, where specialized roles handle lean oversight, in SMEs, FLEs are directly responsible for process adjustments, making their buy-in even more critical.

Our research indicates that management's lack of investment in workers leads to insufficient lean understanding and expertise. They engage workers through rewards and recognition, providing good work organization, but they fail to acknowledge the unique product-related knowledge that FLEs possess. Unlike in large companies, where lean implementation may

be guided by dedicated process improvement teams, lean SMEs rely more on implicit, experience-based knowledge that resides with frontline employees. However, management primarily sees their commitment and support as essential for lean to survive, without fully recognizing that FLEs have specific product-related knowledge that they do not and that they should listen to their suggestions because the workers also want to make production easier for themselves.

Management must ensure that the connection between lean effort from FLEs and rewards is transparent and understood among FLEs. If they do not see the connection, their efforts are minimized. This is detrimental to lean SMEs since successful lean implementation depends on employee involvement in continuous improvement projects and problem-solving. Employee involvement has been mentioned numerous times as one of the critical success factors for lean SMEs specifically (Arabi et al., 2022; Qureshi et al., 2022; Salma et al., 2021; van Dun et al., 2017; Worley & Doolen, 2006), and it positively impacts worker well-being (Bakker et al., 2004; Crawford et al., 2010; Hobfoll, 2001).

Management needs to involve workers in the lean setup process and trust that they are doing good work for the company, especially since FLEs' claim theory is utterly different from the actual application. This discrepancy between lean thinking and theory and reality on the shop floor may contribute to employee dissatisfaction in the long run (Leyer et al., 2021). By involving workers in the lean setup process, management can foster a sense of trust and encourage workers to contribute their best to the company, aligning their theoretical understanding with practical application. In contrast to large firms, where lean strategies are typically introduced through structured top-down initiatives, lean SMEs have the opportunity to leverage their flat hierarchies for more direct and meaningful employee involvement.

2.6.5 General overview with suggestions

Lack of understanding of lean benefits, management support, rewards and recognition, and other factors already appeared through our literature review in Chapter 1. However, some factors have not been mentioned as much in the literature but were prominent in interviews. Management ignorance of FLE's potential for contribution proved to be a bothersome job demand for FLEs in lean SMEs. Although managers involve workers and offer opportunities for ideas and improvements, they mainly focus on the education and training of supervisors. This leaves FLEs frustrated and unmotivated for improvements since the lean introduction and use are unclear. Another distinction that we found was communication. Although communication is an essential cultural change factor and lean job design pillar, we notice differences in communication between immediate supervisors and colleagues as opposed to top management and other departments. Through interviews, we found satisfactory levels of communication among FLEs and supervisors (as opposed to Ramadas & Satish, 2018; Yadav et al., 2019), but lack of communication among top management and FLEs, as well

as inadequate communication across departments, which impacts the work process considerably, and frustrates employees.

Recent literature has begun to underscore the importance of FLE inclusion. When FLEs play an active role in implementation processes, they demonstrate higher commitment and involvement in their workplace (Lacerda et al., 2016). Management should prioritize actively listening to FLEs and fostering agreeing behaviours (van Dun et al. 2017). For FLEs, experience is the most crucial education for successful lean work. We recommend that managers teach FLEs lean methods but allow them to adapt and improve the lean tools according to their work and opinions, as they have a better understanding of the actual process. FLEs possess concrete and detailed knowledge of the actual process, making them best positioned to develop ideas for addressing problems and opportunities in a process (Robinson & Schroeder, 2009). Allowing them to develop their ideas and providing them with the space to express themselves also leads to their higher engagement (Crawford et al., 2010).

It has been proven that FLE perceptions of the actual production performance are highly accurate, indicating their awareness of the production process's strengths and weaknesses (Z. Huang et al., 2021). FLEs have the best overview of their workplace and the daily processes that occur on the shop floor (Wester & Hitka, 2022). Therefore, their involvement is crucial for accurately assessing company performance. Managers should listen to, value, and act on employee suggestions (Z. Huang et al., 2021) and empower them to offer suggestions. Mature lean implementation relies heavily on employee initiative and improvement activities. This habit is necessary to take lean to the next level, including understanding improvements and building on them (Knol et al., 2019). This is especially important in SMEs, which often do not have specialised departments dedicated to lean, so they rely on all employees to carry out the improvements (Knol et al., 2018, 2019). In SMEs, management should start responding to FLEs rather than vice versa (Hines et al., 2022). They become coaches, while employees take on a more proactive role (Knol et al., 2019; Womack & Jones, 2003). FLEs should be encouraged to become self-reliant and behave purposefully to manage themselves and their workplace (Wester & Hitka, 2022). This can be achieved through adequate communication. A lean enabling attitude involves both management and employee commitment (Malik & Abdallah, 2020; Malmbrandt & Åhlström, 2013), and social interactions between management and FLEs are a critical factor for lean practices (Maalouf & Gammelgaard, 2016).

In summary, our research differentiates lean SMEs from large companies and non-lean SMEs by showing that lean SMEs face a unique challenge where the lean approach itself, while designed to empower employees, paradoxically results in the marginalization of FLEs due to a managerial focus on supervisors. Furthermore, we found communication gaps are more pronounced in lean SMEs, especially between top management and FLEs, which is critical for sustaining a lean culture. And finally, the potential of FLEs is underutilized in lean SMEs, despite their superior awareness of the production process—a dynamic that is

less critical in larger organizations with dedicated lean teams and non-lean SMEs that do not pursue continuous improvement with the same intensity. These insights extend the existing literature by explicitly linking these dynamics to the lean context in SMEs, offering practical implications for managers seeking to improve lean implementation in resource-constrained environments.

2.7 Conclusion

This chapter overviews lean SMEs' job demands and resources through qualitative research design. Many works explored the effects of lean on worker outcomes (Anderson-Connolly et al., 2002; Bouville & Alis, 2014; Bouville & Schmidt, 2019; Conti et al., 2006; Cullinane et al., 2014; Jackson & Mullarkey, 2000; Lewchuk & Robertson, 1996; Parker, 2003; Saurin & Ferreira, 2009; Seppälä & Klemola, 2004; Vidal, 2007) but with mixed findings (positive consequences of lean, negative, mixed effects or no significant effects). Only several of those focus on SMEs specifically, although it is proven that lean use in SMEs is exponentially growing. Most studies are quantitative and have a single-case FLE sample (Bouville & Schmidt, 2019). Through interviews, we dive deep into the job resources and job demands FLEs face in lean SME settings.

For lean use in SMEs to be successful and to ensure worker well-being, it is crucial for companies to prioritize workers' involvement in lean practices and educate them to have a greater understanding of lean. Communicating the goals and objectives of lean to workers is also essential (Salma et al., 2021). By providing rewards and recognition for their work, enabling timely information, organizing the workplace, and providing autonomy and support, companies can foster work engagement and motivate workers. Encouraging FLEs to take initiative, solve problems, and take on production responsibility can be motivating, but it also requires energy. However, the active involvement of FLEs is crucial for the success of lean initiatives, and their engagement is a primary driver of any improvement activity.

However, there are elements of lean SMEs that only deplete worker energy without motivating them. We discovered that FLEs have inadequate lean understanding, problems with information flow, and limited resource availability. What is more, they respond negatively to organizational cultural change, such as shifts in management style, changes in work processes, or alterations in team dynamics.

It is imperative for companies to involve their employees in the process and provide them with the necessary resources to do their job without interruption. Believing in their problem-solving skills and the responsibility they can take on is key. This approach can help to minimize the negative impacts of lean on FLEs and maximize the positive effects of job resources, creating a workforce that is engaged and committed.

The findings from this chapter serve as a basis for setting up the job demands-resources model, which is a theoretical framework that explains the relationship between job demands, job resources, and worker well-being, in the lean SME setting. In Chapter 3, we intend to use the qualitative analysis results and expand the JD-R model through a quantitative confirmation of our findings.

3 CHAPTER 3: WORKER WELL-BEING IN LEAN SMES (MOTIVATIONAL AND HEALTH-IMPAIRMENT PROCESS)

For SMEs to achieve long-term success, it is essential to ensure worker well-being, since it leads to increased job satisfaction, motivation and productivity of workers (McLellan, 2017; Sasser & Sørensen, 2016; Taris & Schreurs, 2009; Wright et al., 2007). Worker well-being in lean SMEs refers to the overall health and happiness of FLEs. Work engagement positively impacts the worker's well-being, while exhaustion has negative effects. In Chapter 2, we presented the JD-R model, which explores worker well-being. We suggested which characteristics (job demands and job resources) may contribute to worker health and engagement for FLEs in lean SMEs. We explored the job characteristics that occur in lean SMEs for FLEs through qualitative research in Chapter 2.

Implementing lean methodologies in SMEs aims to enhance efficiency through process streamlining and waste elimination. However, the inherent focus on operational performance in lean environments can inadvertently intensify work demands. Empirical studies suggest that in lean settings—where roles are frequently redefined and continuous improvement is central—employees face heightened pressure to sustain efficiency, often leading to work intensification, job stress, and ultimately, burnout (Mazzocato et al., 2010). In lean SMEs, the challenge is compounded by resource constraints that limit the availability of comprehensive human resource support systems, such as flexible scheduling or wellness programs, which are more commonly found in larger enterprises. Consequently, while lean practices can drive significant productivity gains, they must be implemented with careful attention to worker well-being, ensuring that efforts to streamline operations do not come at the cost of employee health and work-life balance.

Principles of lean proved to be controversial, looking at the worker well-being (Bonavia & Marin-Garcia, 2011; Jackson & Mullarkey, 2000; Seppälä & Klemola, 2004), especially for FLEs working directly on the production lines. There is little research on the use of lean in companies and its effects on employee well-being (Leyer et al., 2021; K. S. Minh et al., 2019). Since lean use is growing in SMEs (Bianchi et al., 2018; Maarof & Mahmud, 2016; Saboo et al., 2014), there is a growing need to focus on that aspect and provide guidelines for achieving good work efficacy alongside satisfactory worker well-being.

There have been no attempts in the literature to reveal the connections between lean working environments and FLE well-being in the SME setting. In this chapter, we will explore the

impacts of JR, challenge and hindrance JD on worker exhaustion and engagement at the workplace in lean SMEs. We will do quantitative research using a questionnaire survey based on the findings from Chapter 2. After testing the JD-R model in the lean SME setting, we will discuss the implications for theory and practice. We will offer insight into how lean SMEs can support their FLEs despite the barriers they may face as smaller organisations.

Choice of constructs for the JD-R model

Many different job characteristics may represent job demands (challenge and hindrance), and job resources. We focus only on the JD and JR specific to FLEs in lean SMEs. Using an exploratory sequential design, we first looked through the literature to find what JD and JR appear in lean companies in general and researched the literature on lean in SMEs to discover which job characteristics are mentioned most (not specifically for the JD-R model but all job characteristics in general). We divided the job characteristics of lean SMEs into challenge and hindrance job demands and job resources. Then, using qualitative research on FLEs in lean SMEs, we discovered what are the differences and similarities of job characteristics in the literature versus practice to explore the topic before collecting quantitative data. Based on literature and qualitative empirical research, we specified job demands and resources in lean SMEs for FLEs. In this chapter, we would like to test the specific JD-R model based on our previous findings related to JD and JR for FLEs in lean SMEs through quantitative SEM analysis.

Going back to the theory and JD-R mentioned in lean research, we discovered some similarities to JD and JR across contexts. However, there are also some significant differences when looking specifically at SMEs. The similarities in lean companies across contexts can be found in challenge job demands. Workers in lean companies face production responsibility, problem-solving and commitment to continuous improvement as challenges (Beraldin et al., 2019; Cullinane et al., 2013). The challenges that occur are the basis of lean methodology. Every level is expected to solve problems (be it on the front line, as a supervisor, etc.) and commit to continuous improvement, regardless of company size or role in the company.

There are some differences between lean companies in general and lean SMEs when looking at job resources. Job resources in lean companies include autonomy, job rotation, feedback and skill utilization, as well as support and training/mentoring (Beraldin et al., 2019; Cullinane et al., 2014; Huo & Boxall, 2017c, 2018b). In lean SMEs, similar to LEs, training and support are essential job resources. However, work organisation and information management (information flow and communication with supervisors) proved even more prominent. SMEs cannot conduct training programs as efficiently and systematically as LEs, so other job resources appear more substantial. Since they have a flatter organisation, this also includes more informal working relationships, so the communication is direct and quicker (Rauch et al., 2017). This may be the reason such job resources are more prominent in lean SMEs.

Usually researched hindrance job demands in lean companies include quantitative demands, work speed, workload (work pace and intensity), and monitoring (Conti et al., 2006; Cullinane et al., 2013; Lindskog et al., 2016). We found cultural changes and requirements for organisational climate change to be the most prominent hindrance to job demand among FLEs in lean SMEs. Following this, limited availability of resources, lack of communication, problems with information flow, and inadequate lean understanding and expertise are expressed repeatedly in interviews.

In the quantitative part of the study, we made a balance between the most prominent job characteristics affecting worker outcomes (namely, work engagement and exhaustion and job performance) and the ones specific to lean SMEs. We already distinguished them through the thematic analysis, and based on this, we propose that job resources for FLEs in lean SMEs include good work organisation and communication/information management; challenge job demands in lean SMEs are represented through problem-solving and hindrance job demands in lean SMEs include cultural changes/changes in organisational climate and limited availability of resources. We emphasize that all relationships and propositions in the following paragraphs pertain specifically to FLEs in lean SMEs.

We included only a few job characteristics due to the complexity of the SEM model, choosing only the job characteristics we identified as most important for lean SMEs through qualitative analysis. The detailed reasoning for job characteristics can be found in the literature overview. After that, we follow up with a quantitative exploration of the job characteristics and the impact on worker outcomes.

3.1 Job demands and resources in lean SMEs: literature review

3.1.1 Lean SME challenge job demands

Problem-solving

Problem-solving demands are active cognitive processing requirements of a job (Wall et al., 1995), reflecting the extent to which work requires new solutions to problems at the workplace which may be nonroutine, complex or ambiguous (Morgeson & Humphrey, 2006). It is inherently demanding, requiring significant cognitive, emotional, and sometimes physical investment from employees. In lean SMEs, where resources are often limited, the intensity and frequency of problem-solving tasks can be high. This high demand can lead to exhaustion among FLEs as they continuously engage in complex decision-making processes under potentially stressful conditions.

In lean SMEs, the implementation of lean principles creates a unique dynamic compared to larger enterprises. On one hand, research by Che Mamat et al., (2014) indicates that FLEs in SMEs, often starting with lower qualifications, may have limited opportunities to engage in

problem-solving and decision-making processes. On the other hand, studies by de Haan et al. (2012) and Yadav, Jain, Mittal, Panwar, & Sharma (2019) reveal that when lean methodologies are fully integrated into SME operations, there is a strong emphasis on active employee participation in lean work process design. This approach encourages even those with initially lower qualifications to contribute to continuous improvement and solution generation. Thus, while lean implementation in SMEs may be challenged by the baseline skill levels of FLEs, the lean framework simultaneously drives a culture that seeks to overcome these limitations by promoting inclusive, bottom-up problem-solving—a contrast to the more hierarchical decision-making structures often found in larger enterprises. However, employees may be reluctant to take over these responsibilities, which may cause stress, exhaustion and worker dissatisfaction (Abolhassani et al., 2016; Vidal, 2007).

This relationship is supported by the JD-R model, which posits that higher job demands, such as intense problem-solving, drain an employee's physical and psychological resources, leading to exhaustion (Bakker & Demerouti, 2007). Therefore, the first hypothesis is formulated based on the premise that the demanding nature of problem-solving in resource-constrained environments will be positively related to exhaustion. Conversely, problem-solving can also stimulate employees and enhance their engagement (Cullinane et al., 2013; Huo & Boxall, 2018). This stimulation arises because problem-solving often involves creativity, learning, and the overcoming of meaningful challenges, which can be inherently rewarding (de Haan et al., 2012; Huo & Boxall, 2018; Yadav, Jain, Mittal, Panwar, & Sharma, 2019). According to the JD-R model, while job demands can lead to exhaustion, they can also act as challenges that foster employee engagement when employees perceive them as opportunities for personal growth and achievement. Empirical studies suggest that when employees successfully engage in problem-solving, it can increase their sense of competence and achievement, thereby boosting their work engagement (Bakker & Demerouti, 2007). This hypothesis leverages the idea that despite its demands, problem-solving in lean SMEs, when managed effectively and perceived positively, can lead to higher levels of work engagement.

Based on these findings, both from theory and our qualitative study, we conclude:

H1: Problem-solving is positively related to exhaustion.

H2: Problem-solving is positively related to work engagement.

3.1.2 Lean SME hindrance job demands

Cultural changes/changes in organisational climate

Cultural change factors include facing uncertainty and changes due to introducing a lean culture in the company, which expects proactive work from FLEs and regular contributions to continuous improvement. The cultural change factors include fear of failure, unclear

changes, changes in routine, skill requirements and job responsibility. The impact of changes on FLEs depends on their nature, implementation process, and resources available to support the transition.

Although organisational cultural change is one of the most common critical success factors for lean SMEs (Yuik et al., 2020), SMEs don't have a methodology for managing it effectively (Yuik & Puvanasvaran, 2020). This leads to FLE resistance to change, which is explored extensively as a barrier to lean success (Chan et al., 2019). SMEs must provide FLEs the opportunities to get familiar with the changes occurring because of lean since they have a perception that lean brings extra burden to their current workload (Yuik et al., 2020).

FLEs are required to take on multiple tasks and responsibilities due to lean implementation, but they are reluctant to actively engage in lean activities (decision-making, problem-solving), and suddenly forcing such participation may lead to lower well-being (Hopp, 2018; Vidal, 2007). This may be because new tools and principles are being implemented, but FLEs are not empowered enough to participate in lean design and influence everyday decisions (Marin-Garcia & Bonavia, 2015). So, this change, aimed at improving efficiency and productivity, may lead to increased worker exhaustion (Choi et al., 1997).

Limited availability of resources

Crawford et al. (2010) describe lack of resources as hindrances, and include missing or defective equipment or missing or outdated information and present them as resource inadequacies. In SMEs, these inadequacies may be of human (Belhadi & Touriki, 2016), financial, time and technical nature (Alefari et al., 2020; Assarlind, 2015; Bocquet et al., 2019).

SMEs adjust their organisational choices depending on the availability of resources, workers, and time, choosing inexpensive and simple lean tools (Mathur et al., 2012; Yuik & Puvanasvaran, 2020) or adding work requirements to workers. This may include overtime or work overload, which negatively affects their well-being (Conti et al., 2006; Lindskog et al., 2016; Sahoo & Yadav, 2018; Tajri & Cherkaoui, 2015). Technical constraints may also require additional workload, exhausting workers (Achanga et al., 2006; Alkhoraif et al., 2019; Mathur et al., 2012).

Through restricted SME financial capabilities (Achanga et al., 2006), employees may receive lower rewards for participating in continuous improvement activities or active problem-solving, which may reduce their engagement at work and increase exhaustion (Siegrist, 1996).

Therefore, we test the following hypotheses:

H3a: Cultural changes/changes in organisational climate are positively related to exhaustion.

H3b: Limited availability of resources is positively related to exhaustion.

3.1.3 Lean SME job resources

Good work organisation

Good work organisation indicates that FLEs have a clear overview of communication channels, responsibilities, decision-making processes, requirements, and resources available for FLE work. Investing in a good work organisation creates a supportive work environment that benefits employees and the organisation.

Generally, lean businesses employ more teams to solve problems, value employee recommendations highly, depend on input from managers and employees, and meticulously record production processes (Forza, 1996). What is more, the simple system structure of SMEs allows for quicker communication and, consequently, decision-making (Yusof & Aspinwall, 1999). If the work is organized well, it may improve FLE efficiency by streamlining processes, reducing waste and increasing efficiency, which makes the FLEs' job more manageable. Good work organisation reduces FLE confusion and frustration and facilitates clear communication among workers and managers (O. Jones & Macpherson, 2006), which in turn reduces the risk of errors and misunderstanding. A well-organized job also means higher workplace safety and reduced risk of accidents and injuries.

Communication/information management

Communication/information management suggests open communication channels, easy access to information, and the existence of both formal and informal communication channels. It is one of the enablers of lean implementation in SMEs (Hu et al., 2015; Rymaszewska, 2014). Direct or good communication is considered a critical success factor in this context (Rose et al., 2013; Timans et al., 2012). Specific to SMEs, there is direct communication between managers and employees because of a less rigid hierarchy, so employee trust in lean increases (Dora et al., 2016). Because of this flatter organisation, there are more informal working relationships, so the communication is also characterised as direct and quick (Hu et al., 2015). Another peculiarity of SME communication is quick communication, decision making and swift implementation of strategies (Kotey, 2005; M. H. Smith & Smith, 2007).

If there is adequate communication in a company, employees accept changes easier and it may reduce their resistance to new practices that are being implemented (Puvanasvaran et al., 2009). Formal and informal communication may enhance their engagement (Hilton & Sohal, 2012; Worley & Doolen, 2015) and commitment (Ng et al., 2006).

H4a: Good work organisation is positively related to work engagement.

H4b: Communication/information management is positively related to work engagement.

3.1.4 Relation to job performance

In this research, job performance is defined as the extent to which employees meet or exceed the expectations of their roles within the organisation. This encompasses various dimensions that can be quantitatively assessed, including employees working efficiently, managing their work priorities, work result, and the time they require to finish their tasks. These facets of job performance not only reflect the immediate outcomes of an employee's role fulfilment but also contribute to broader organisational metrics such as productivity and operational results (Sadikoglu & Zehir, 2010).

Job performance can be understood as a multidimensional construct that encompasses behaviors and activities undertaken by employees to achieve the goals and objectives of their role. In line with the work of Ramos-Villagrasa et al. (2019), job performance may be assessed through self-reported measures that capture various aspects of work planning, prioritization, and time management. This framework suggests that effective job performance includes the ability to plan tasks efficiently, establish priorities, and execute responsibilities within set timelines. Employees who are adept in these areas consistently manage their workload with an awareness of desired outcomes, efficiently organizing tasks and effectively utilizing time to meet goals. Thus, these dimensions provide a comprehensive view of how employees align their behaviors with work demands to achieve individual and organizational success.

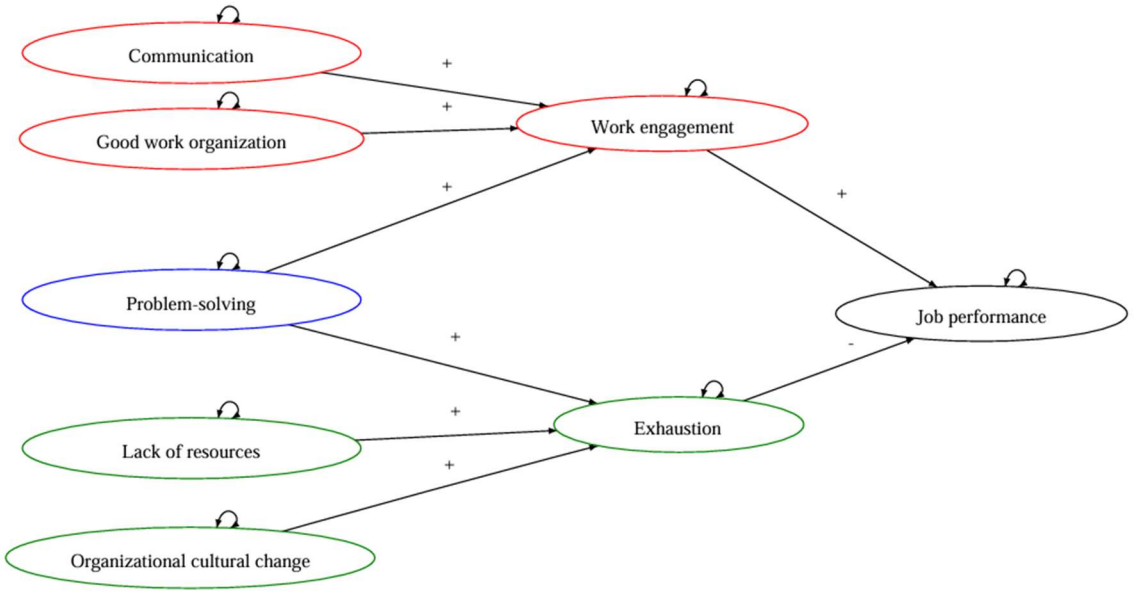
Research already explored the relationship between work engagement and job performance in various contexts. Schaufeli et al. (2002) tested the relationship among students and found they are more likely to pass their exams if they are more engaged. Bakker et al. (2008) found work engagement positively related to in-role performance, extra-role performance and innovativeness. Corbeanu and Iliescu (2023) also found a correlation between work engagement and job performance. Overall, work engagement helps employees take initiative at work and pursue learning goals on a daily basis (Sonnentag, 2003). We assume a similar connection will happen among FLEs in lean SMEs since lean methodology inherently tries to engage workers. On the other side of the model, according to the conservation of resources theory, emotionally exhausted employees are more likely to conserve their energy and withold efforts in retaining high performance. There is limited but existing evidence identifying a negative relationship between emotional exhaustion and job performance (Cropanzano et al., 2003; Quattrochi-Tubin et al., 1982; Wright & Bonett, 1997; Wright & Cropanzano, 1998).

H5: Work engagement is positively related to job performance.

H6: Exhaustion is negatively related to job performance.

Figure 8 represents all of the abovementioned propositions that we test in the second part of this chapter.

Figure 8: Proposed JD-R model of lean SME job characteristics



Source: own work.

3.2 Research context, method, data collection and preparation

3.2.1 Questionnaire design

We defined our concepts of interest (specific lean SME JD and JR) and operationalized them into questionnaire items using already tested measurement scales from the literature. To avoid research bias, we reversed some items in the questionnaire. We also randomized the questions so there was no visible pattern for workers to recognize constructs.

Since the focus of the questionnaire was FLEs, we had to consider their specifics in answering it, such as available time and energy for filling it out, as well as language proficiency and terms used. We made sure the response items were not mutually exclusive and that we captured all possible answers for the concepts we were interested in.

We reviewed the questionnaire to ensure the items were unambiguous with the help of operations and quality management experts, discussing potential questionnaire inconsistencies. We also checked for content validity, modifying the questionnaire based on the comments from these experts (Fadly Habidin & Mohd Yusof, 2013).

We did a pilot study to test the validity of the questionnaire. We couldn't hypothesize with the pilot study since it was statistically underpowered. We did a pilot test with a small group of FLEs to ensure the questionnaire is clear and understandable so we can avoid potential

issues or problems with the questionnaire, which need to be addressed before the study is conducted.

3.2.2 Measures

The constructs we measured were connected to job resources (good work organisation and communication/information management), hindrance job demands (organisational cultural change, lack of resources) and challenge job demands (problem-solving). Dependent variables included work engagement, exhaustion and job performance. Most of the statements used in this questionnaire were taken from the JD-R literature. Questionnaire design with constructs, sources, original scale names and items can be found in Appendix 7. A seven-point Likert rating scale was used for all mentioned constructs, ranging from one (strongly disagree) to seven (strongly agree).

Regarding job resources, good work organisation was presented through six different items, reversed from organisational governance deficiencies in the Gothenburg Manager Stress Inventory (GMSI) (Eklöf et al., 2010), an example of one item being "*I have to use informal channels to get resources for my work*". Communication and information management as job resources were measured through five items (Spasojevic Brkic & Tomic, 2016), an example of an item is "*In our organisation, it is easy to obtain or get certain information*".

Hindrance job demands were measured through two constructs. One is organisational cultural change with nine items from Ramadas & Satish (2018) (e.g. "*I face fear of failure in my company*"). Lack of resources is represented through seven items reversed from (Schaufeli, 2015), for example, "*I have all the tools (tools, equipment, instruments, software) needed to do my job properly*". Challenge job demands include problem-solving (five items, for example, "*I am required to deal with problems which are difficult to solve*") taken from Wall et al. (1995).

Dependent variables included work engagement, exhaustion and job performance. Demerouti et al. (2001) explored burnout through JD-R, and one of the elements of the JD-R model was exhaustion. In that article, to measure the second part of the model, they used the Oldenburg Burnout Inventory (OLBI), which includes measures of burnout, including exhaustion. The scale has been validated several times, and was proven consistent and a good measure of burnout. Reliability was confirmed through internal consistency and test-retest reliability (Halbesleben & Demerouti, 2005), and validity through factorial and construct validity (Halbesleben & Demerouti, 2005). The exhaustion sub-scale in OLBI consists of eight items, which refer to general feelings of emptiness, need for rest, state of physical exhaustion and overtaxing at work (Bakker & Demerouti, 2007), an example of one item being "*There are days when I feel tired before I arrive at work*".

The second dependent variable, work engagement, represents a fulfilling and positive work-related state of mind characterized by vigour, absorption and dedication (Bakker &

Demerouti, 2007). Employees feel a sense of connection to their work activities and feel able to tackle the different job demands they face. The UWES scale has been extensively used in the literature to further confirm the JD-R model in many different industries and contexts (Bakker et al., 2007; De Braine & Roodt, 2011; Hakanen et al., 2008; Van den Broeck et al., 2010; Xanthopoulou et al., 2007b) which further confirms it relevance. We excluded absorption from the scale, finding the items less applicable to lean-type companies. Also, dedication and vigour are considered core dimensions of engagement (Cullinane et al., 2014; Demerouti & Bakker, 2011; Huo & Boxall, 2017b; Kaiser et al., 2020; Salanova et al., 2005).

Job performance was measured through a scale developed by Ramos-Villagrasa et al. (2019) consisting of five items (e.g. "*I manage to plan my work so that I finish it on time.*"). A seven-point Likert rating scale was used for this side of the model, as well.

3.2.3 SEM analysis

We used structural equation modelling (SEM) to test our hypotheses. It is a multivariate statistical analytic method employed to examine structural relationships. This method examines the structural link between measured variables and latent constructs by combining component analysis and multiple regression analysis. This involves building a model that identifies the relationships between the different variables measured by the questionnaire and testing the hypotheses that were developed at the beginning of the study. The results of the SEM analysis can provide insights into the factors that influence the attitudes and behaviours of first-line employees in the context of management and organisation. SEM is often used in operation management empirical studies (Shah & Goldstein, 2006), as well as studies connected to the JD-R model (e.g. Brauchli et al., 2013; Lewig et al., 2007; Schaufeli, 2015; Van den Broeck et al., 2010).

We examined the factorial validity of the measurement scale. This was done by comparing the pilot study, determining the factor structures of the measurement scales, and cross-validating this using the entire sample. We did not present independent and dependent variables in the predicted order before running the study to lessen the possible impact of common method variance (Terglav et al., 2016). Harman's single-factor test showed no substantial effect of common method variance on the research findings (P. M. Podsakoff et al., 2012).

Research has already tested the JD-R model in general in lean companies. Now, we test the specific JDR model that we developed based on the specifics of lean SMEs through theoretical and qualitative empirical research. We tested the model with SEM analysis. We built the model on a theoretical background, and since we cannot directly observe latent variables, we need corresponding indicators, which we analyse through the Confirmatory Factor Analysis (CFA).

3.2.4 Data collection and sample

To find our sample, we contacted lean managers working in lean SMEs in Croatia and Slovenia. After they agreed to participate in the study, we forwarded the questionnaires to their first-line employees. 300 questionnaires were collected across seven companies from Croatia and Slovenia from July until October 2023. The questionnaires were collected mainly on-site and a few online. When we collected questionnaires on-site, we tried to include every first-line employee in the company. They filled out the questionnaire in a separate room without a set time frame for filling out the survey. The list of lean tools used by companies whose employees participated in the survey can be found in Table 18.

Table 18: List of lean practices used in companies included in the questionnaire study

Lean bundle*	**Lean practice (tool/method)**	**A**	**B**	**C**	**D**	**E**	**F**	**G**
JIT	SMED/Setup time reduction (cycle time reduction, quick changeover)	X	P	X	X	P	P	
	Kanban (Pull production) (pull system, pull system production, kanban-system)			X	X	P		P
	Visual control (visual management, notification system, Andon)	X	X	X	X	X		P
	Lot size reduction (small lot sizing, Just-In-Time)	X	P	X	P		P	P
	Value Stream Mapping	X	P	X				
	Continuous flow	X	P	X	P		X	
	Cellular Layout (cellular manufacturing)	X	P	X		X	X	
	Heinjunka (levelling the workload, level scheduling, production levelling)	X		X		X		
TQM	Kaizen (continuous improvement)	X	X	X	X	P	X	P
	Standardized Work/Process	X	X	X	X	X		P
	Poka-yoke (mistake proofing, error proofing)		P		X			P
	Quality management programs (total quality management)	X	X		P	X	P	
	Jidoka (Automation)	P						
	Supplier-related practices (supplier involvement, supplier quality, lean supply chain)	X				X		
	Customer-related practices (customer involvement)	X				X		
TPM	5S (workplace organisation or 6S)		X	X	X	X	P	P
	Total productive maintenance (statistical process control, preventive maintenance)		P		X	P		
HRM	Employee training and teamwork (people empowerment, workforce engagement)	X	X		X	X	X	X
	Employee involvement	X		X	X	X	X	X
	Cross-functional team (quality circles)	X			P	X	X	X
Connected practices	Six Sigma				P			
	PDCA	X				X	X	P

Note: X means the lean practice is fully implemented, P means it is partially implemented in the company.

Source: own work.

We collected 273 questionnaires for analysis in total. Several questionnaires were excluded from the analysis due to incomplete responses or a substantial number of missing values. The respondents were all first-line employees in SME lean companies, ranging from 19 to 64 years old. There were predominantly male respondents (77%) as opposed to female (23%), and they usually had a high school diploma (around 88% of respondents). Sample descriptive statistics divided by companies can be found in the Appendix 8.

3.2.5 Data preparation

A brief pilot study tested the questions to see whether they were easily understandable and to check how long the questionnaire would last. To ensure the scale is easily understandable for FLEs, we also did a back-to-back translation since we distributed the questionnaire to Croatian and Slovenian companies. The original scales are in English; we translated them into Croatian and Slovenian, and another external researcher translated them back into English. We combined the questionnaires from all seven companies included in the study. There were three constructs with reversed items in the questionnaire (good work organisation, lack of resources and lack of information flow). We calculated the values of the reversed items. We also grouped items into parcels for constructs with a bigger number of items, reducing them to 3-4 item groups per construct. We did this by forming an item as an average of same-construct item responses. By combining items, the overall number of indicators is reduced. This leads to a more parsimonious model, which simplifies estimation and interpretation. The model becomes less complex. Since parcels aggregate multiple items, the influence of sampling fluctuations and item-level peculiarities is diminished, leading to more stable estimates (Matsunaga, 2008). To ensure that our findings are not sensitive to the specific way items were collapsed into parcels, we conducted two robustness checks. For ensuring item-to-construct balance, we verified that each parcel adequately represents the full construct. This was done by ensuring that the items grouped within a parcel share a clear theoretical basis and cover different facets of the construct. Secondly, we re-ran the SEM analysis using alternative configurations in which items were assigned to different parcels. The key parameter estimates, model fit indices, and structural relationships remained consistent across these alternative parceling schemes. This indicates that our results are robust to changes in the selection of collapsed items.

The analysis was done in JASP 0.18.3. version. We handled missing data with the FIML (full information maximum likelihood) option in JASP, which doesn't replace or impute missing values but instead uses the maximum likelihood algorithm with all available data to estimate parameters (Eekhout et al., 2015).

3.3 Main model

3.3.1 Measurement model and descriptive statistics

Pearson correlations and reliability coefficients (Cronbach's α) are displayed in Table 19. Through Cronbach's α, we demonstrated the internal consistency of our scale (Field, 2009). A common interpretation of the coefficient is $\alpha < 0.5$ for low reliability, $0.5 < \alpha < 0.8$ for moderate (acceptable) reliability, and $\alpha > 0.8$ for high (good) reliability. In our model, we have moderate and high reliability of our measures.

We averaged the items within a scale for creating a composite score to enable a robust SEM analysis. In data analysis, taking the average of items instead of using each item individually is often essential for simplifying constructs, particularly when performing structural equation modeling (SEM). SEM requires a manageable number of variables to estimate relationships effectively, as too many indicators per construct can lead to estimation difficulties, reduced model fit, and potential convergence issues (Hair et al., 2019; Kline, 2016). By averaging items within a scale, researchers create a composite score that preserves the overall construct while reducing complexity, thereby facilitating a robust SEM analysis. This approach ensures that the latent variable captures the intended concept without overwhelming the model with excessive indicators, ultimately improving model interpretability and fit.

Table 19: Pearson correlations and reliability coefficients

Variable	GWORG	COMM	OCC	LCKRES	PROBSOLV	EXH	WENG	JOBPERF
1. GWORG	(0.699)							
2. COMM	0.174**	(0.636)						
3. OCC	-0.621***	-0.148*	(0.773)					
4. LCKRES	-0.034	-0.366***	-0.068	(0.586)				
5. PROBSOLV	-0.156**	0.022	0.170**	0.022	(0.582)			
6. EXH	-0.262***	-0.146*	0.381***	0.190**	0.294***	(0.586)		
7. WENG	-0.178**	0.340***	0.115	-0.199***	0.073	-0.130*	(0.869)	
8. JOBPERF	-0.090	0.127*	0.033	-0.137*	0.207***	0.056	0.345***	(0.80)

*Note: * p < .05, ** p < .01, *** p < .001. Numbers in brackets represent Cronbach's alpha.*

Source: own work.

We performed CFA using maximum likelihood estimation in JASP. Convergent and discriminant validity were tested for the 8-factor measurement model (including good work organisation, communication, problem-solving, organisational cultural change, lack of resources, work engagement, exhaustion and job performance). We specified the model and tested all first-order constructs through single-factor CFA. The model showed an acceptable fit to the data: X^2 (224) = 435.844, RMSEA = 0.059, SRMR = 0.060, and CFI =0.900. All indicators underlying a particular factor have loadings >0.50, which indicates the presence

of acceptable convergent validity (Anderson & Gerbing, 1988). All observed variables had significant loadings (p<.001) on their latent factors, showing a reliable measurement model.

3.3.2 Structural model

After model estimation, we examined the fit indices and parameter estimates for interpreting SEM results. Through fit indices, we evaluate the model fit. We went through the most common tests and indices: Root Mean Square Error of Approximation (RMSEA) checks what is the average misfit per degree of freedom, where values smaller than .05 show a very good fit, values between .05 and .08 signify a mediocre fit, and above .08 poor or unacceptable fit. Incremental fit indices (for example, CFI, TLI, NNFI) compare the model to the baseline model - the higher fit index means a better model fit. If the indice is >.95, it signifies a good fit. The goodness of fit index (GFI) shows an acceptable fit when the values are >.90.

We tested a model including direct hypothesized relationships between job resources (good work organisation and communication) and work engagement, challenge job demand (problem-solving) on both work engagement and exhaustion, and hindrance job demands (organisational cultural change and lack of resources) on exhaustion. Finally, we tested the link between work engagement and exhaustion on self-measured job performance. The structural model provided an acceptable fit to the data: X^2 (273) = 391.249, CFI = 0.924, RMSEA = 0.051 and SRMR = 0.063, GFI=0.993.

The fit indices for both CFA and SEM indicate an overall acceptable model fit. While the chi-square test is significant, this is expected given the sample size (N = 273) and model complexity (Kline, 2016; Schermelleh-Engel et al., 2003). The RMSEA values (0.059 for CFA, 0.051 for SEM) fall within the widely accepted range for good fit (Browne & Cudeck, 1992; L. Hu & Bentler, 1999; MacCallum et al., 1996), and the SRMR values (0.060 and 0.063) further support this conclusion (Schreiber et al., 2006). While the CFI values (0.900 and 0.924) do not reach the stricter 0.95 threshold, values above 0.90 are generally considered acceptable in applied research, particularly for complex models with multiple factors (Bentler, 1990; Byrne, 2013). Therefore, the model demonstrates a sufficiently strong fit to justify interpretation of the structural relationships.

The model shows communication is positively related to work engagement (β= 0.448, p<.001), but good work organisation is negatively related to work engagement (β= -0.323, p<.001), which was surprising and did not support our hypothesis. Problem-solving, organisational cultural change and lack of resources are positively related to exhaustion (problem-solving, β=0.268, p<.001, org.cult.change β=0.448, p<.001, lack of resources β=0.505, p=0.002). We did not find a significant relationship between problem-solving and work engagement (β=0.009, p=0.903). Finally, work engagement is positively related to job performance (β=0.295, p<.001), but exhaustion did not show significant relation to job performance (β=0.119, p=0.084). The regression coefficients can be found in Table 20.

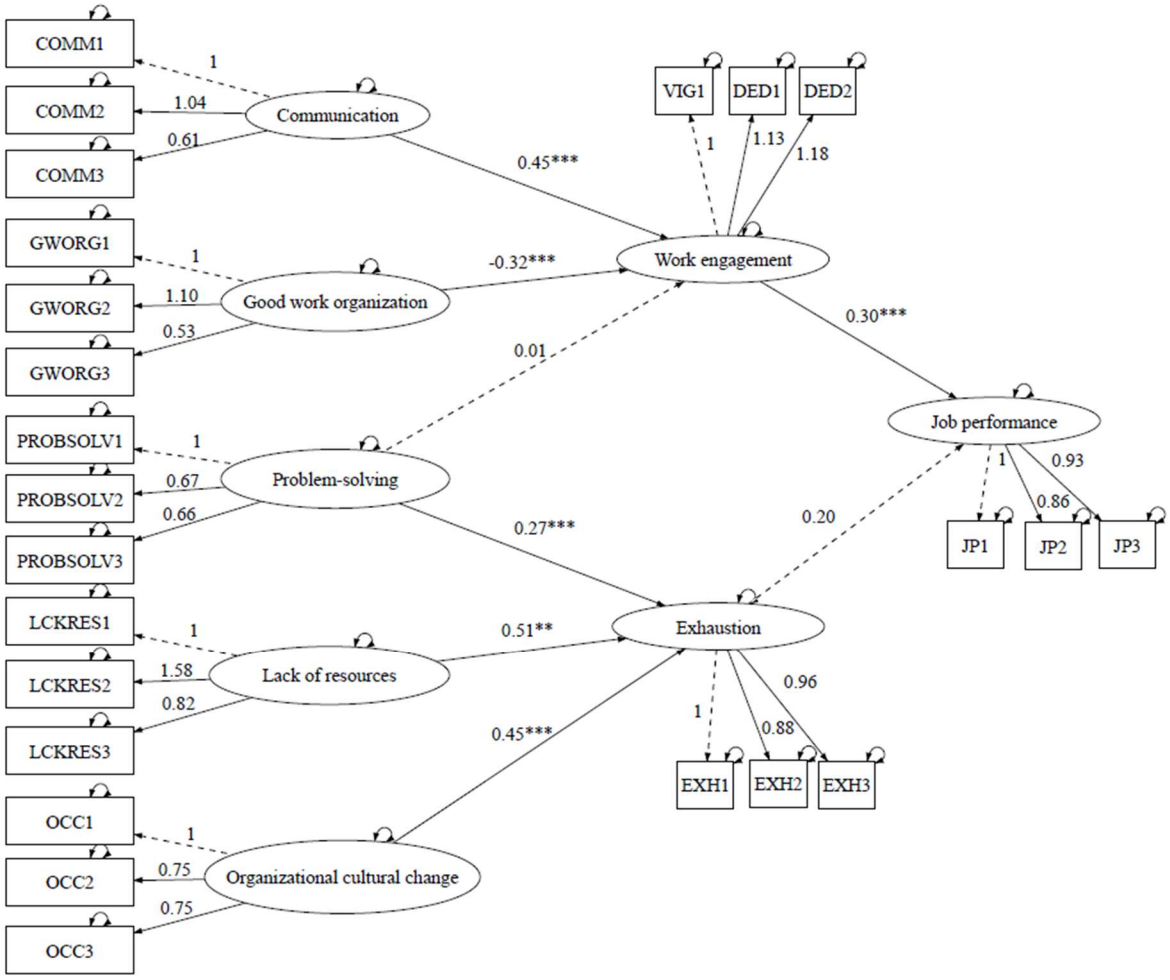
Table 20: Regression coefficients

Predictor	Outcome	Estimate	Std. Error	z-value	p	95% Confidence Interval	
						Lower	Upper
probsolv	exh	0.268	0.079	3.397	< .001	0.114	0.423
orgCC	exh	0.448	0.084	5.305	< .001	0.282	0.613
lckres	exh	0.505	0.161	3.127	0.002	0.188	0.822
vigor_dedication	job_perf	0.295	0.050	5.869	< .001	0.197	0.394
exh	job_perf	0.119	0.069	1.727	0.084	-0.016	0.255
comm	vigor_dedication	0.448	0.081	5.514	< .001	0.288	0.607
probsolv	vigor_dedication	0.009	0.071	0.121	0.903	-0.130	0.147
gworg	vigor_dedication	-0.323	0.087	-3.722	< .001	-0.492	-0.153

Source: own work.

The path diagram (Figure 9) visualizes the variables, paths, and errors in the model.

Figure 9: SEM analysis results (path diagram)



*Note: *** <.001, **<.01. Source: own work.*

3.4 Discussion

This study examined how various job characteristics affect different worker outcomes of first-line employees in lean SMEs. Our results offer support for the basic postulates of the JD-R model, claiming adequate job resources increase work engagement and job demands impact employee exhaustion (Demerouti et al., 2001). The present article evaluated the JD-R model by incorporating specific lean SME job characteristics that haven't been tested yet into the model. The findings are consistent with the health-deteriorating and motivational processes assumed by the JD-R model (Bakker & Demerouti, 2007) in the lean SME context, focusing on FLEs.

Through our research, we found that organisational cultural change, limited availability of resources, and problem-solving are all associated with FLE exhaustion on the job (hypotheses 1 and 3). Although we discussed problem-solving as a challenge job demand, we did not find it positively impacts work engagement, so we couldn't show evidence for hypothesis 2. We also found that good work communication (with managers and coworkers) correlates with work engagement. However, we didn't find a positive connection between good work organisation and work engagement, so we only partially supported hypothesis 4, claiming that job resources positively impact work engagement. Our model showed good work organisation negatively impacts work engagement. Furthermore, we expanded the original JD-R model to see how it reflects FLE job performance. We found work engagement is positively associated with job performance (hypothesis 5), but we could not conclude on the connection between exhaustion and job performance (hypothesis 6). The list of hypotheses and SEM model outcomes are shown in Table 21.

Table 21: List of hypotheses and SEM model outcomes

Hypothesis	Predicted direction	Supported/not supported	Estimate	Significance level
H1: problem solving → exhaustion	+	Supported	0.268	p<.001
H2: problem solving → work engagement	+	Not supported	0.009	p=.903
H3: hindrance job demands → exhaustion	+	Supported		
H3a: organisational cultural change → exhaustion	+	Supported	0.448	p<.001
H3b: limited availability of resources → exhaustion	+	Supported	0.505	p=.002
H4: job resources → work engagement	+	Partially supported		
H4a: good work organisation → work engagement	+	Not supported (opposite direction)	-0.323	p<.001
H4b: communication -> work engagement	+	Supported	0.448	p<.001
H5: work engagement → job performance	+	Supported	0.295	p<.001
H6: exhaustion → job performance	-	Not supported	0.119	p=.084

Source: own work.

Although various studies have covered the JD-R model in lean, the present study is the first to provide empirical evidence of job demands and job resources impacts in lean SMEs, with

its specifics. Namely, we are the first to explore the constructs of organisational cultural change and lack of resources as potential job demands used in the JD-R model. The relationships to exhaustion have been implied through literature (Choi et al., 1997; Conti et al., 2006; Lindskog et al., 2016; Marin-Garcia & Bonavia, 2015), but we are the first to include the constructs in the JD-R model, finding a positive relationship between lack of resources and organisational cultural change to exhaustion. We also provide evidence on the generalizability of communication as a job resource construct, applied across contexts, as results show a positive impact on work engagement (Hilton & Sohal, 2012; Worley & Doolen, 2015). We also upgraded the basic model by testing the impact of work engagement and exhaustion on job performance.

Problem-solving discussion

Through our quantitative analysis, we confirmed that problem-solving is a job demand faced by FLEs in lean SMEs that positively correlates with exhaustion. However, we found no impact of problem-solving on work engagement.

Our findings constrast with some of the literature researching problem-solving in lean companies, only focusing on different levels. Cullinane et al. (2013) and Huo & Boxall, (2018) found that problem-solving, as a lean-specific challenge job demand, increases the motivational potential of lean resources and acts as a motivational challenge to employees. When workers have appropriate job resources, challenge job demands pose less exhaustion to workers. Problem-solving as a challenge job demand has the potential to foster employee development and make work interesting for FLEs which impacts work engagement. However, our focus on FLEs shows that problem-solving as a lean job demand in isolation depletes the energy of employees. However, it does not provide the motivational challenge which would increase their work engagement. This highlights a key contribution of our study—while prior research has positioned problem-solving as an inherently motivating challenge in lean environments, our findings indicate that for FLEs in lean SMEs, it often functions more as an energy-draining job demand rather than an engagement-enhancing resource.

To explain this difference, first, we need to understand the differences in problem-solving. Problems may vary according to their structuredness (from well-structured problems to ill-structured), abstractness (from situated to abstract) and complexity (simple to complex problems) (Jonassen, 2001). The different kinds of problems require different approaches to problem-solving. Managers must offer training dependent on the type of problems first-line employees face. The type of management approach to problem-solving affects the success of problem-solving, but there are also constraints FLEs face which limit their ability to use the preferred approaches (Tucker et al., 2002).

There is a distinction between fixing problems (first-order solutions) and identifying underlying causes (second-order solutions). First-order solutions focus solely on solving and

overcoming current problems. It occurs because the FLEs focus on the first-order solutions without seeking to change the underlying causes of a problem, but rather only solving problems to be able to continue working (Tucker et al., 2002). Such behaviour diminishes motivation to discover and remove underlying problem causes. Since FLEs directly experience problems on the production line (Åhlström & Karlsson, 1996; Shah & Ward, 2007) and have valuable knowledge of the front line, this data, with lack of motivation to share the knowledge (i.e. no work engagement stemming from problem-solving demands), is lost (Tucker et al., 2002).

FLEs usually do not have time for in-depth problem-solving in the work cycle, and their immediate responsibilities prevent them from resolving problems from the perspective of future benefits. However, in lean, the main objective of problem-solving is to identify the root cause of the problem and reduce any production defects, and employees must be exposed to tools and techniques for successful problem-solving. Therefore, the processes in mature lean companies already have the groundwork for second-order problem-solving.

Lean companies usually have a formal system of expressing FLE ideas for improvement through various lean tools (e.g. A3 reports, 5-whys, Pareto charts, PDCA cycles, Fishbone diagrams and others). This process relies on team leaders to disseminate the ideas further to higher management. However, informal or ad hoc idea implementation is also possible, and it empowers employees to solve problems with resources under their control (Engen & Magnusson, 2015). This may be more prominent in lean SMEs, which have fewer hierarchy levels. Group problem-solving is emphasized in lean companies, and the tools are used to alleviate problem-solving in FLEs. Beraldin, Danese, and Romano (2019) concluded that problem-solving is positively and significantly related to work engagement. However, they didn't find a significant relationship to exhaustion, which is the opposite of our findings. They claim that first-line employees are supported by standard procedures and psychologically safe conditions, which makes problem-solving easier and not exhausting. However, according to Tucker et al. (2002), employees feel more accomplished and proud when they offer first-order solutions rather than finding root causes. First-order solutions are easier and more familiar, and employees are able to solve the problems independently and quickly. The time-starved employees also reach for first-order solutions as quick fixes that enable them to move on with their regular jobs as soon as possible. However, lean tools force FLEs to be constantly involved and seek underlying causes of problems, which may be why we didn’t find a significant relationship between problem-solving and work engagement. Fixing root causes typically requires a collective effort, exiting the comfort zone and acquiring new skills (Deming, 2018), which all drain energy from employees and don’t offer immediate rewards. This distinction is particularly relevant when comparing SMEs to larger organizations. In larger, more structured lean enterprises, employees may have better access to resources such as training, time allocation, and managerial support for problem-solving. These factors could reduce exhaustion and enhance engagement, whereas in SMEs, the absence of such support may turn problem-solving into a more taxing experience.

SMEs usually employ FLEs with lower skill levels, which don't have the mindset of skill enhancement (Achanga et al., 2006), which may be the reason they don't find problem-solving very motivating and engaging. Moreover, studies on larger or non-lean organizations often highlight that problem-solving is structured within dedicated teams or improvement programs rather than being an ad hoc part of employees' daily workload. This structural difference could explain why our findings in lean SMEs differ from research focusing on larger or non-lean firms, where job demands related to problem-solving may be buffered by additional organizational support.

Several contextual factors may explain why problem-solving did not enhance engagement in our study. One key factor is insufficient lean training—without adequate skills, employees may struggle with problem-solving, leading to frustration and exhaustion rather than engagement. Additionally, SMEs often implement lean primarily for cost-cutting and operational efficiency. In such environments, without proper investment in employee development, problem-solving may become an added burden rather than a stimulating challenge, increasing stress and fatigue. Another critical moderating factor could be perceived control. If employees feel they lack autonomy in addressing problems or are pressured into problem-solving without adequate support, the experience may lead to exhaustion rather than engagement.

Results may indicate that in lean SMEs, these moderating factors may have tilted the balance toward exhaustion. When efficiency is prioritized over employee empowerment, and resources such as autonomy, support, and feedback are insufficient, even an inherently engaging task like problem-solving can become a source of stress. Although problem-solving has the potential to enhance engagement when framed as a challenge and supported by sufficient job resources, in environments where these conditions are lacking, its impact may shift toward exhaustion.

Health-related outcomes (discussion on exhaustion)

Exhaustion, as a consequence of intense physical, affective and cognitive strain (Demerouti et al., 2001) has been studied profusely as a part of worker well-being (Akkermans et al., 2013; Alarcon, 2011; Baeriswyl et al., 2016; Bilotta et al., 2021; Kattenbach & Fietze, 2018; Lindskog et al., 2016; Rastogi et al., 2018; Sardeshmukh et al., 2012). It is a consensus that job demands (both hindrance and challenge) have a positive impact on exhaustion and deplete worker energy. Our findings confirm this claim in the lean SME setting, focusing on FLEs. In this quantitative study, we found a statistically significant positive relationship between cultural changes (changes in organisational climate) and limited availability of resources on exhaustion, as well as already discussed problem-solving.

Organisational cultural change in this research was portrayed as the differences in routine or job responsibilities in lean implementation, as well as potential fear of negative changes in the company (financial loss, loss of status or the job, adding responsibilities). New programs

and changes introduced as a part of lean philosophy aim to improve productivity and efficiency, but they lead to increased FLE exhaustion (Choi et al., 1997). There is usually a lack of understanding of the implemented changes and reasons behind them. FLEs are required to proactively include changes at their workplace. However, at the same time they might not be empowered enough to participate in lean design themselves (Marin-Garcia & Bonavia, 2015), especially in SMEs where there is a more organic structure conductive to informal learning (K. Y. Wong & Aspinwall, 2004). Trying to implement any changes, such as improvements in productivity, is difficult for FLEs since it was proven they regress to previous working methods they were using before the implemented changes (Found et al., 2006). Therefore, getting used to new routines and job responsibilities is taxing to workers, and this causes exhaustion.

Our study contributes to the existing literature by highlighting that while organizational change-related exhaustion has been studied in general work environments, its impact in lean SMEs is particularly pronounced due to the simultaneous introduction of lean-specific demands, such as continuous improvement and standardization. Unlike in larger companies, where structured training and change management strategies may buffer the effects of organizational change, SMEs often implement lean without extensive employee involvement or systematic support, making the transition more exhausting for FLEs.

Limited availability of resources (e.g. disposal of tools and equipment, adequate workload distribution) also significantly positively relates to exhaustion, which is in line with Conti et al. (2006), who found, among others, that lack of tools and frequency of resource removal have a positive effect on exhaustion. There is also plentiful research testifying to poor access of SMEs to financial and other resources (Chaplin, Heap, and O'Rourke 2016; Gnanaraj et al. 2012; Kock, Gill, and Erik Ellström 2008; Pitta 2008; Yadav, Jain, Mittal, Panwar, & Sharma, 2019), which FLEs can't see directly, but can feel through lack of staff to distribute the workload, or not enough equipment for everybody to work uninterrupted.

Since SMEs lack adequate funding (Achanga et al., 2006; Ates et al., 2013; M. H. Smith & Smith, 2007), this financial inadequacy leads to less resources available for FLE support in lean endeavors, such as hiring consultants for support (Achanga et al., 2006; Tam & Gray, 2016b). What is more, larger companies have more internal resources at their disposal to enable learning, such as learning and development specialists (Strange, 2012). In contrast, SMEs rarely have these resources focused on employee learning available. This distinction is particularly important when considering exhaustion as a long-term consequence. In larger firms, employees facing high job demands may have access to structured training and mentorship that enhance their adaptability and resilience. In SMEs, however, the absence of formal learning structures means that FLEs must navigate lean-related changes with minimal support, potentially intensifying their exhaustion over time.

Motivational outcomes (discussion on work engagement)

We have found that in lean SMEs, communication across levels and between coworkers is connected to their motivational outcomes, namely work engagement. Enabling easier communication may lead to higher creativity on the tasks FLEs are assigned to. We have found that communication is a critical job resource which strengthens work engagement in FLEs in lean SMEs. This may be prominent in lean since formal systems/tools exist to ease the development of ideas in workers (e.g. kaizen, A3, and similar). FLEs possess great potential for innovations at the workplace which is to a great extent unknown to middle and top management (Engen & Magnusson, 2015), so management must ensure adequate surroundings to enhance their potential and enable them to express freely through adequate communication channels. Employees need knowledge of their tasks, creative skills and the motivation to do the task so they can come up with new ideas (Engen & Magnusson, 2015). This will lead to greater work engagement and, ultimately, job performance.

Only communication yielded the expected results in relation to work engagement. We also tested good work organisation and problem-solving with respect to work engagement, but did not find relationships suggested by theory. In this study, good work organisation represents the existence of formal channels, a clear overview of the decision-making processes in the organisation, adaptation to strict process requirements, adequate delegation of resources and the ability to implement management decisions at the first level. We predicted a positive relationship between good work organisation and work engagement, but we found a negative significant relationship. One possible explanation is in the measurement and interpretation issues. In the qualitative research, we operationalized good work organization as the occurrence of daily issue-resolution meetings (tiered hierarhical meetings), clear work instructions and weekly work plans. It is possible that the quantitative study captured aspects of good work organisation that employees found less desirable, so the negative relationship with engagement might reflect those nuances. In the quantitative research we broadened the meaning of good work organisation, finding that clarity and structure, although perceived as energising, may also signal a lack of flexibility or innovation for some FLEs, potentially diminishing engagement.

Another possible explanation for this finding relates to the specifics of SMEs as opposed to larger lean companies. SMEs usually have owner-managers, which may not have adequate management know-how and focus more on short-term solutions rather than creating a firm base for long-term lean benefits (Achanga et al., 2006). They usually employ simple operational planning and control systems (Ates & Bititci, 2011; O'Reilly et al., 2015), but this may lead to a lack of systematic procedures (Yadav, Jain, Mittal, Panwar, & Lyons, 2019b), so FLEs are more worried and strained since the system is susceptable to quick changes. The negative relationship between good work organisation and work engagement may lie in the FLE attitudes towards formal channels and lean requirements for standardization, efficiency and continuous improvement. Although SMEs have more informal procedures and don't have a rigid structure as LEs, lean as a methodology requires a certain level of standardization and uniformity. If the implementation of lean results in

stringent work procedures or intensive performance monitoring, this clear structure my be perceived as a form of control rather than support from the viewpoint of FLEs, and it may also become too rigid which in turn will negatively affect employee perceptions and well-being (Holweg, 2007). While clarity and structure can improve coordination, is the system becomes overly rigid, it may hinder the flexibility needed for engagement and creativity of workers (Tushman & Nadler, 1986). Therefore, even "good" organisational structures can have unintended negative effects if they do not align with employee needs for autonomy and flexibility (De Jonge & Dormann, 2006).

Lean SMEs may also narrowly focus on optimizing processes, sometimes at the expense of addressing individual needs and motivations. If the employees feel lean SMEs prioritise efficiency rather than employee well-being, the expected engagement may be lacking. Therefore, even well-organized work systems need to balance structure and operational efficiency with autonomy and support to foster employee engagement (Parker et al., 2001).

Job performance, work engagement and exhaustion

There is a number of studies confirming a positive relationship between employee work engagement and job performance (Bakker et al., 2012; Demerouti et al., 2010; Halbesleben & Bowler, 2007; Salanova et al., 2005; Xanthopoulou et al., 2009), and also specifically targeting FLEs (Ghlichlee & Bayat, 2021; Karatepe, 2011a; Karatepe & Aga, 2012; "Miracle" Qi et al., 2018). We confirmed the same relationship in the case of FLEs in lean SMEs, suggesting they also have higher job performance when they are more engaged in their work.

We did not find a negative significant relationship between exhaustion and job performance in lean SME FLEs. However, the decrease in job performance is most commonly presented as a negative consequence of exhaustion (Halbesleben & Buckley, 2004; Maslach, 2003). Prior research has shown inconsistencies in findings considering only emotional exhaustion and performance, especially when including several sources of performance information (Keijsers et al., 1995; Lazaro et al., 1984; Randall & Scott, 1988). Halbesleben & Bowler, (2007), in their research, propose that the relationship between emotional exhaustion and job performance should be mediated, and find that motivation mediates the relationship between emotional exhaustion and job performance. What is more, high job resources such as autonomy or social support can buffer the negative effects of exhaustion on performance (Bakker & Demerouti, 2007). Potential moderators or mediators for this relationship may include perceived job control, social support or individual differences in stress resilience.

Moreover, the impact of exhaustion on job performance may become more pronounced over a longer time period. Our cross-sectional research design may not fully reveal the temporal lag in decreasing performance after prolonged exhaustion. A longitudinal approach could provide further insights into how sustained exhaustion affects job performance over the long term.

The absence of a significant relationship in our study may also relate to the specifics of SMEs. Although there is increased exhaustion at the workplace, closer peer relationships and faster communication in SMEs may mitigate the negative impact. The continuous improvement principle of lean involves frequent feedback, supportive supervision and a collaborative culture. This may lead to compensatory behaviours such as reliance on teamwork and help from colleagues to mitigate individual fatigue, which preserves overall performance. SMEs tend to be more flexible in adopting lean principles, allowing for a more adaptive implementation, tailoring it to reduce unnecessary burdens and better support employees (Holweg, 2007). These adaptive lean strategies may potentially offset the negative effects of exhaustion. Moreover, the effects of stress and exhaustion on performance can differ in the short term versus the long term. In lean environments, where rapid process improvements are a priority, employees might exhibit enhanced performance in the short run due to urgency and heightened focus. However, over time, the cumulative effects of exhaustion—if not mitigated—could lead to performance decrements that cross-sectional research might not reveal (Ganster & Rosen, 2013).

3.4.1 Practical implications

This research helps in clarifying the list of demands and resources essential for FLEs in lean SMEs specifically, and the results can be used as a risk-assessment guide for managers. Management has the responsibility of identifying demands across levels in the organisation, putting in effort to diminish the impact of the demands on worker health, and increasing their support in augmenting job resources for higher work engagement and job performance of lean FLEs.

The lean process can be modified to maximise FLE engagement while preventing exhaustion. Increased communication (both formal and informal) seems to be an ideal individual-focused intervention for improving FLE performance through higher motivation. Managers should give easier access to information and always have it available to FLEs. Informing employees plays a key role in changing employee attitudes towards lean, so open communication and availability of information are key in motivating employees.

Limited availability of resources exhausts workers, so managers must ensure workers have all the necessary tools for work so they can fulfil the job requirements, avoiding fatigue. This entails adequate work equipment available to FLEs (tools, software, instruments) but also enough personnel so that workers don't have to cover multiple work roles or feel pressure because of overwhelming work tasks. If they perceive they can't rely on colleagues when work gets overwhelming or there is no one to fill in for them, their energy depletes.

Changes in organisational culture concerning lean also exhaust workers. If FLEs face fear of failure, financial loss or additional responsibilities due to lean, their energy decreases. A similar happens if their routine breaks due to lean, and they don't see the reasons, benefits or rewards behind the lean implementation.

There is no single role in lean SMEs which can take on problem-solving on their own, especially since we found it impacts exhaustion without confirming the relationship to work engagement, making it similar to other energy-depleting job demands such as organisational cultural change or lack of resources. Management should provide tools for handling problem-solving in FLE circumstances, such as allowing time for finding adequate solutions and increasing training and education to make skilful workers.

Overall, based on our findings, managers should focus on increasing communication to create work engagement and enable adequate resources on par with their requirements for FLEs. FLEs should clearly see the intentions behind lean in SMEs so the resistance may diminish and they avoid exhaustion.

3.5 Limitations and future research suggestions

Although this study provides new insights into the JD-R model in a new context of FLEs in lean SMEs, there are certain limitations we face. This study was open to all industries, but the final sample mainly consisted of production industry (foundry, manufacturing, machinery production). We advise future research to further validate our findings regarding lean-specific job demands and resources for service industry and different occupational groups. We focused solely on first-line employees, but there is research focusing on frontline managers (Huo & Boxall, 2017b) and white-collar vs. blue-collar workers (Seppälä & Klemola, 2004), so the comparisons with the same structural model would provide new insights into differences and specifics of each group. One significant limitation is also that we included only Croatian and Slovenian companies so caution must be exercised in generalizing the results to other contexts. The element of national culture must be taken into consideration (Beraldin et al., 2019; Bortolotti et al., 2015). Furthermore, this study focused on the job characteristics of FLEs in lean SMEs at the individual level. While data was collected from FLEs across seven different SMEs, the aim was to explore general patterns in job characteristics rather than organizational differences. Therefore, a multilevel analysis was not conducted, as the primary interest was in the relationships between job characteristics and individual outcomes, rather than variations across companies. However, future research could apply a multilevel approach to examine potential company-level influences on these relationships.

In our study, we set strict limitations on which lean companies are included in the research, including only mature lean cases. However, a lean implementation may vary in the extent and length of the implementation process, industry type and level of employee involvement in implementation (Beraldin et al., 2019; Conti et al., 2006; Cullinane et al., 2014; Hasle et al., 2012; Parker, 2003). If employees are not used to lean tools or are part of lean companies for a longer period, the results may differ. We suggest future studies consider this aspect of lean.

This research provided no conclusive evidence for the role of problem-solving as a challenge job demand. Beraldin, Danese, and Romano (2019) had a similar conclusion but with opposite findings, as already discussed. We confirm problem-solving as a job demand, in line with the JD-R model. However, we couldn't find a significant relationship with work engagement, claiming strict production rules burden FLEs. This drives them to solve problems in haste and with no time to reflect on them but to chase production further. We invite future research to focus on problem-solving as a challenge job demand and try to explain in-depth the differences that appear in literature, as well as our findings. Future studies could incorporate qualitative interviews to gain deeper insights into how employees perceive problem-solving within their specific work contexts. This approach would help uncover contextual nuances that quantitative methods may overlook. Additionally, incorporating interaction terms in the model—such as *problem-solving* × *job autonomy* or *problem-solving* × *supervisory support*—could provide a more comprehensive understanding of potential moderating effects, offering valuable insights into the conditions under which problem-solving enhances or hinders work engagement.

In our quantitative study, we found a statistically significant negative relationship between good work organization and work engagement, contrary to our initial hypothesis of a positive relationship. While we have proposed possible explanations for this unexpected finding, further research is needed to clarify this relationship. We suggest a qualitative follow-up study to explore how FLEs interpret and experience good work organization in their daily roles. Additionally, moderation analyses could provide valuable insights by examining interaction effects with variables such as autonomy, perceived control, or individual preferences for structure. Investigating whether different aspects of work organization—such as clarity versus flexibility—have distinct impacts on engagement could further illuminate the underlying mechanisms driving this negative relationship.

We only included a handful of job characteristics in the model, so we suggest future research expands the range of job characteristics and their effects on various job elements, such as job satisfaction, career development, or employee absenteeism.

This is a cross-sectional study, which limits our ability to establish causal relationships between lean job design and worker outcomes. We suggest a longitudinal study for a more in-depth analysis to confirm relationships and study the level of work engagement and exhaustion at different lean company implementation phases. Additionaly, a longitudinal study could also unveil possible explanations on the temporal dynamics of exhaustion and performance, potentially revealing long-term effects that were not captured in this study, including the expected impact of sustained exhaustion on job performance. Furthermore, we suggest a more complex, multi-level or multi-group analysis to examine these relationships across a broader range of organizations, varying in size, level of lean implementation, and other contextual factors. Such an approach could provide deeper insights into the boundary conditions of lean job design and its differential effects on employees in diverse organizational settings.

4 DISCUSSION

4.1 Restating the research problem

Implementing lean methodology in a company significantly alters workers' job design (Cullinane et al., 2013). This transformation introduces additional responsibilities such as quality control, continuous improvement, and maintenance (Delbridge et al., 2000), and brings about different job demands like production pace or task interdependency (Cullinane et al., 2013). These changes, if not managed effectively, can potentially compromise employee well-being (Anderson-Connolly et al., 2002; Parker, 2003). However, it's crucial to note that employee participation is a key factor for achieving successful long-term lean results (Marin-Garcia & Bonavia, 2015; Scherrer-Rathje et al., 2009). Therefore, it's in the best interest of organizations to create a lean work design that not only preserves the benefits and long-term results of lean but also takes into account worker well-being.

Introducing lean to the company increases the job demands for FLEs. This depletes worker energy (Koukoulaki, 2014) and triggers physical and psychological effects such as exhaustion (Kubicek et al., 2013). Under lean, these demands may include longer working hours, faster production pace, more extensive multitasking requirements or increased workload (L. Zhang, 2015). New lean job requirements demand higher worker skills (Jackson & Mullarkey, 2000) or higher cognitive demands, leading to job stress (Yeow et al., 2012). Lean also signifies shorter takt time, which increases the work pace of employees (Lewchuk et al., 2001), alongside repetitive activities.

Given the demanding nature of lean requirements, we have developed a job design model for lean SMEs that carefully considers both the positive and negative impacts of lean on FLE outcomes. Lean job characteristics can have both positive (motivational) and negative (health-depleting) effects on FLEs (Beraldin et al., 2019; Cullinane et al., 2013, 2014; Huo & Boxall, 2017b; Lindskog et al., 2016; Ulhassan et al., 2014). This research contributes to the ongoing debate of mixed findings of consequences lean leaves on various worker outcomes (Hasle et al., 2012; Landsbergis, Cahill, & Schnall, 1999; Longoni et al., 2013; Parker, 2003; Saurin & Ferreira, 2009). However, we go beyond this general discussion of lean's positive or negative effects on employees. We strive to strike a balance between job demands and resources to create a lean job design in SMEs that benefits both the organization and its employees.

We aim to clarify how to efficiently deploy the positive effects of lean and counteract its adverse effects. This approach enables lean SMEs to maximize worker well-being while simultaneously achieving company benefits through high job performance. We offer theoretical and practical insights into the roles of FLEs in lean SMEs and create an appropriate lean SME job design that allows for energized, engaged FLEs. Through the JD-R model, this research provides a better understanding of the mechanisms and processes that

inhibit and motivate employee engagement, cause exhaustion, and impact job performance in a lean SME context.

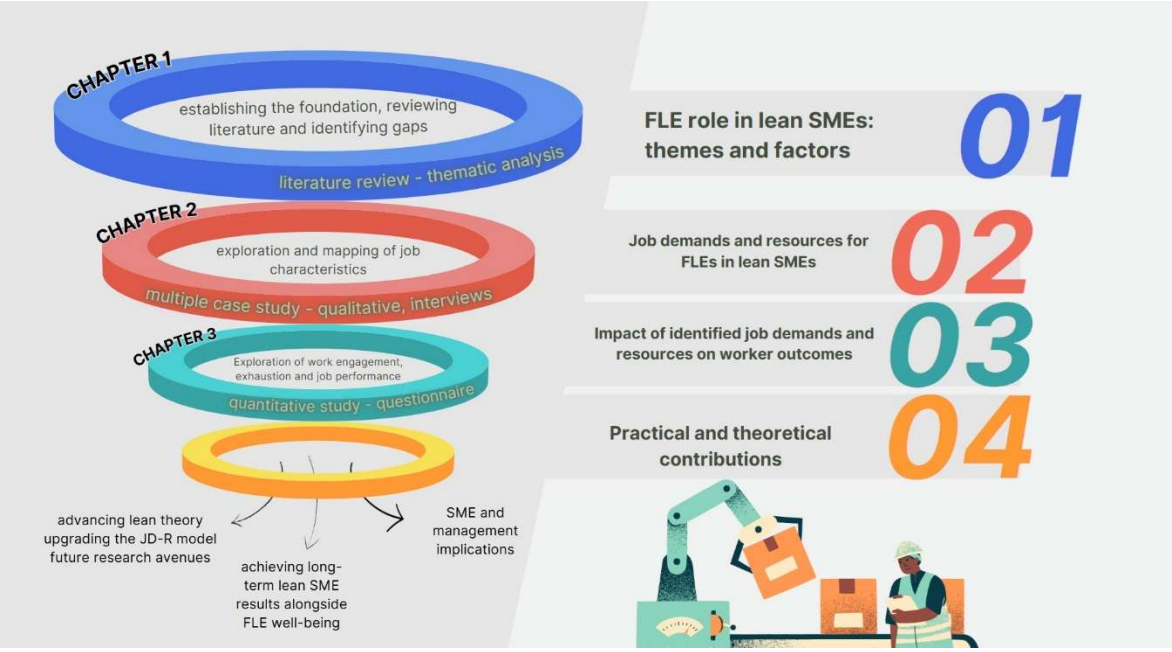
This context of lean SMEs is currently underexplored in research regarding worker outcomes. Lean methodology differs in use in SMEs and large enterprises. Different challenges, barriers and hindrances appear, along with different supporting factors. SMEs are less likely to implement lean compared to LEs (Shah & Ward, 2003), mainly due to the specific challenges and constraints they face, such as financial (Achanga et al., 2006; Caloghirou et al., 2004), time, cultural (Caldera et al., 2019), and technical constraints (Narula, 2004). Lack of commitment from managers, their leadership and the resources needed for implementation are vital barriers; and poor communication across levels and dissemination of knowledge of lean benefits are main hindrances that prevent higher implementation of lean among SMEs (Shrimali & Soni, 2017; Yadav, Jain, Mittal, Panwar, & Sharma, 2019; Zhou, 2016). Firm size moderates relationships in lean management; differences also exist in employee commitment and performance management; and SMEs are more flexible when it comes to responding to customer demands (Malik & Abdallah, 2020; Saridakis et al., 2013; Siegel et al., 2019; Taylor & Taylor, 2014). Other enabling factors also make the use of lean easier in SMEs than in LEs: unique business, more accessible communication across levels, flexible production systems, and the SME leaders themselves (Alkhoraif et al., 2019; Hu et al., 2015). Still, being only marginally familiar with lean, SMEs often fear the implementation costs and subsequent benefits (Achanga et al., 2006; Bhamu & Singh Sangwan, 2014; Buehlmann & Fricke, 2016).

In this dissertation, we research the involvement of workers in lean SMEs, building on the JD-R model, which is used to understand various job characteristics that foster employee well-being (Lesener et al., 2019). The core assumption behind the model is that employee well-being is affected by job characteristics divided into job resources and job demands (Bakker & Demerouti, 2007; Brauchli et al., 2013; Shevchuk et al., 2018b). Through this research, we confirmed the applicability of the JD-R model in the lean SME context. Our findings refine the JD-R framework for smaller, resource-constrained businesses and offer practical insights for improving employee well-being and performance in lean SMEs. Focusing on this specific context, we deepen the understanding of the JD-R framework and provide additional support for the model. This model explores worker well-being by balancing positive and negative job characteristics (Schaufeli & Taris, 2014). We use this framework to explore first-line worker level of engagement in lean SMEs, the level of exhaustion dependent on job demands and the overall impact on job performance.

The dissertation consists of three main chapters. In the first chapter through a literature review, we make a general overview of the role of FLEs in lean SMEs, identifying themes and factors concerning FLEs' roles in lean SMEs and forming a framework of FLEs roles in lean SMEs. We dive deeper into FLE worker outcomes through a qualitative study in Chapter 2, expanding the findings of identified job characteristics through interviews with managers and FLEs in lean SMEs. In Chapter 3, we divide a few selected job characteristics

into job demands and job resources and quantitatively test their influence on FLE exhaustion, work engagement and job performance through the JD-R model. The general overview of the dissertation is presented in Figure 10.

Figure 10: General overview of the dissertation



Source: own work.

Overall, this dissertation study:

- identifies factors and themes of FLE roles in SMEs,
- identifies job demands and resources for FLEs in the context of lean SMEs,
- concludes on worker outcomes in lean SMEs, building on the JD-R model,
- discusses the impact of lean use in SMEs on FLE well-being,
- confirms the applicability of the JD-R model in the lean context in SMEs and upgrades the model based on the specifics of lean SMEs,
- examines the correlation of newly identified job demands and job resources with work engagement, exhaustion and job performance.

4.2 Summarising key findings

Our findings reveal a novel perspective on lean in SMEs, portraying it as a resourceful yet demanding work environment with engaging and exhausting attributes. This research is a departure from previous studies, as we demonstrate the motivational role of lean job resources and the health-impairing role of lean job demands (Conti et al., 2006; Cullinane et al., 2013; Jackson & Mullarkey, 2000) in a new context. By adapting the JD-R model to the lean SME setting and focusing on FLEs, we have introduced a fresh angle to the study of lean implementation. Our study is the first to specifically address FLEs and uncover the

unique job design in lean SMEs, predicting worker outcomes. We found that lean SME-specific job demands can deplete FLE energy, but they also fail to serve as motivational challenges that predict work engagement. This finding sets our study apart from others that claim some job demands can be challenging to workers, but also act as motivational challenges that predict worker engagement (Cullinane et al., 2013). Our hypotheses validate previous research, revealing both positive and negative employee outcomes of lean implementation (Anderson-Connolly et al., 2002; Conti et al., 2006; Cullinane et al., 2013; Godard, 2004; Jackson & Mullarkey, 2000; Seppälä & Klemola, 2004).

In Chapter 1, we provide a comprehensive summary of FLEs' roles in lean implementation in SMEs. We identify the main themes and factors related to FLEs' role in lean implementation in SMEs and determine associated enablers and barriers. These insights can help practising managers facilitate lean acceptance and enhance the likelihood of successful lean implementation. The themes and their underlying factors are identified through content analysis and represent groups constructed based on shared-meaning topics related to the role of FLEs in SME lean implementation. The four main themes representing the FLEs' role in lean SMEs include cultural change factors, employee characteristics (competence/personal traits), management involvement and lean job design. Each consists of enablers and barriers that either inhibit employee roles in FLEs, or enhance them. The literature overview systematically presents what has been done so far in the field of lean in the SME context, focusing specifically on FLEs. We aim to provide a better understanding of the roles of FLEs in lean implementation for SMEs and address the operational benefits beyond efficiency improvements, equipping managers with the knowledge to navigate these challenges effectively.

Cultural change factors include commitment (engagement), lean awareness program, teamwork involvement, empowerment and culture characteristics. The enablers which enhance FLE roles in SMEs are engaging job characteristics such as training, practising and mentoring (Alefari et al., 2017), leadership, teamwork, innovation and organisational culture (Burawat, 2019; Li et al., 2015). Other enablers include creativity fostered by a lean environment (de Haan et al., 2012), inclusion in lean policies, programs and everyday decisions (Marin-Garcia & Bonavia, 2015), and enhancing employee awareness of lean benefits (Eswaramoorthi et al., 2011). Barriers to cultural change factors mainly centre around lack of awareness or lousy perception of lean among FLEs (lack of understanding of the benefits or health and safety procedures, perceived as additional work) (Alkhoraif & McLaughlin, 2018b; Bergquist & Westerberg, 2014; Burawat, 2019).

Employee characteristics include creativity, confidence, resistance and trust, motivation, knowledge and skills and adaptability. Creativity is an essential personal characteristic. Using it wisely can positively affect worker job satisfaction and turnover (de Haan et al., 2012), creating a positive lean transformation atmosphere (Darcy et al., 2014; Saunders et al., 2014; Yadav, Jain, Mittal, Panwar, & Lyons, 2019b). Failing to explore worker creativity, on the other hand, may lead to lower motivation of employees (Majava &

Ojanperä, 2017). Their lack of knowledge on lean, confidence and resisting changes are barriers hindering FLEs in lean SMEs. In the literature, we found that problem-solving demands are positively associated with worker creativity (Huo & Boxall, 2018), and trust is a core value employees need to have to enable good lean transformation in a company.

Theme 3 refers to management involvement factors, which include management commitment to lean, communication of lean strategy, manager-first-line employee relationship, and support (information feedback, receptiveness to suggestions and external support). Literature suggests that both top and middle-management commitment are essential for enhancing FLE roles in lean SMEs (Alefari et al., 2017; Hernandez-Matias et al., 2019). Management support and feedback, organisational support and external support are all important enablers for FLE roles in lean SMEs (AlManei et al., 2017; Caldera et al., 2019; Hallstedt et al., 2013; Huo et al., 2019; Kull et al., 2014). Lack of management commitment leads to difficulties in sustaining the methodology (Mamat, Md Deros, et al., 2015), and lack of communication between workers and supervisors is identified as a process barrier preventing successful lean implementation in SMEs (Ramadas & Satish, 2021).

The final theme, lean job design factors are work design, work complexity and pace (work intensification) and appraisal and rewards. Integrating rewards and recognition may build trust among employees (Moeuf et al., 2016), and creating a culture of communication reduces resistance to change among FLEs (Puvanasvaran et al., 2009). However, barriers to lean job design such as lack of training , lack of information (Bhamu & Singh Sangwan, 2014; Worley & Doolen, 2015), or increase in work intensity (Anderson-Connolly et al., 2002; Bouville & Alis, 2014) lead to hindering worker outcomes, reducing the lean potential in SMEs.

After identifying the main themes and factors related to FLE roles in lean SMEs, in Chapter 2, we focus on identifying job demands and resources specific to FLEs in the lean SME context. In this chapter, we qualitatively explore job demands workers face in lean SMEs, shed light on job resources they obtain to ease the work strain and explore the potential worker outcomes stemming from identified job demands and resources, namely exhaustion and work engagement. From an academic perspective, we are adapting the JD-R model to a lean SME environment, upgrading it and adjusting it to this context. Using a qualitative interview approach with managers and FLEs in lean SMEs, we verify the job demands and resources identified through a literature review and place them in a lean SME context (Cullinane et al., 2013). This chapter elaborates on the theoretical findings from Chapter 1 on the role of FLEs in lean SMEs, exploring and mapping worker outcomes.

Qualitative key findings are divided into job resources, challenge and hindrance job demands. Job resources for FLEs in lean SMEs include rewards and recognition, good work organization, experience and autonomy, support and information management and communication. FLEs take pride in their work; they feel energised when it is recognised. Also, having a well-organized shop floor makes the job easier, combined with workers'

experience and autonomy. They appreciate a clean and orderly work environment. Lean can form a motivating environment for FLEs by transferring tasks and responsibilities to FLEs. Management must recognise the potential of product- and process-related knowledge FLEs accumulate at their workplace and ensure the lean effort from FLEs is transparently recognised.

Qualitatively discovered hindrance job demands among FLEs in lean SMEs include poor production planning, organisation and limited availability of resources. Focusing on specific parts of the process enables FLEs to see the micro parts that need repair. Hence, the problems in information flow, including lack of communication with management, frustrate them. They also receive less training on lean, so the lack of understanding of the 'why' parts of the process may cause energy depletion. This also relates to changes in organisational culture, which are necessary for lean implementation. These changes often create restraints for workers who are used to uniform work.

The literature demonstrates that lean management presents positive challenges and fulfills employees (de Treville & Antonakis, 2006; Marin-Garcia & Bonavia, 2015). Active participation from employees is crucial to achieve the continuous improvement a lean company strives for. This presents a challenge to employees as workplaces often require work standardization and rigid procedures, making it difficult to find room for participation and problem-solving. However, the potential benefits of lean management, such as continuous improvement and employee fulfillment, make these challenges worthwhile.

Interviewing both managers and FLEs revealed significant discrepancies between the two. Management expects everyday work results alongside providing prompt solutions to first-line problems. However, we found that despite the direct demands management puts on FLEs, they hesitate to listen to FLEs directly, focusing more on immediate supervisors. This highlights the urgent need for a mindset change in management. Management expects a mindset change, but they do not trust the workers enough to teach them about lean and give them enough autonomy. Their views on what may be a stressor or motivator differ. Ignoring FLE understanding of lean may lead to severe consequences since successful lean implementation depends on employee involvement in continuous improvement projects and problem-solving.

Chapter 2 underscores the significance of FLE inclusion in the lean philosophy of SMEs. We qualitatively explore which lean SME job characteristics shape employee behavior and well-being. Through interviews in three lean SME case companies, we found the most considerable emphasis on recognition and rewards, good job organization and work environment, co-worker and supervisor support, and communication as job resources. Challenging job demands include problem-solving, mindset changes in FLEs, and production challenges. It is crucial to recognize the integral role of FLEs in addressing these challenges. Hindrance job demands in lean SMEs for FLEs include a lack of lean awareness and understanding among FLEs and management ignorance of FLEs and their potential

contribution. These job characteristics occur across all cases, regardless of the type of production or other variables.

Chapter 3 moves deeper into understanding worker outcomes in lean SMEs through quantitative analysis of selected findings in Chapter 2. We examine the suitability of the JD-R model for understanding the relationship between lean job design and employee outcomes. The JD-R framework proposes direct relationships between job design and worker outcomes, which we confirm in the context of FLEs in lean SMEs.

The model and the results provided essential implications for worker outcomes in FLEs in lean SMEs. In particular, the results suggest job characteristics that create a positive work environment, enhance engagement, deplete energy, and exhaust workers. As expected, communication enhances work engagement and organisational cultural change, while a lack of resources and problem-solving depletes worker energy. Increased motivational outcomes positively impact job performance, whereas there is no apparent connection between health-impairing outcomes (exhaustion) and job performance. Surprisingly, problem-solving does not increase work engagement and alleviate exhaustion. Instead, it seems it is treated similarly to other job demands, making it a hindrance job demand. We explore the reasons behind this in the following section—the summary of key findings by chapters presented in Table 22.

Table 22: Summary of key dissertation findings by chapters

Chapter	Aim	Study type	Main findings	Contributions	Limitations
CHAPTER 1: Importance of first-line employees in lean implementation in SMEs: a systematic literature review	Identify what has been researched so far regarding FLEs in lean SMEs and the main themes, factors and related drivers and barriers of lean in SMEs related to the role of FLEs.	Systematic literature review of 135 international scholarly peer-reviewed literature dealing with the role of FLEs in lean SMEs	Four main themes regarding FLE roles in lean SMEs were identified: - cultural change factors - employee characteristics - management involvement factors - lean job design	Summarised the role of FLEs in lean SMEs, and identified themes and factors of FLE roles in lean SMEs. These serve as a guide and research agenda for researchers to analyse and enrich the existing evidence and a reference for more successful lean implementation.	- subjectivity in coding decisions, missing a small portion of relevant literature
CHAPTER 2: Identifying job characteristics specific to first-line employees in lean SMEs	Elaborate on the theoretical findings on the role of FLEs in lean SMEs: examine job demands and job resources FLEs face and explore potential worker outcomes that stem from these job demands and resources	Multiple case study: qualitative, semi-structured interviews with managers and FLEs from three Croatian case companies	- motivational job resources (recognition and rewards, good work organisation, information management and communication, support,…) - energy-depleting hindrance job demands (organisational cultural change, lack of lean awareness, management ignorance of FLE contribution…) - both motivational and energy-depleting challenge job demands (production responsibility, problem-solving, challenging work)	First distinction of lean SME job characteristics specific to FLEs, recognizing which are motivational and which energy-depleting, elaborating on different viewpoints on lean set-up in a company between FLEs and management	- analysing qualitative data involved inductive reasoning - deriving the patterns, themes and categories, which is subject to the researcher's perspective and skills - purposeful sampling due to the nature of the topic (no official database of companies with lean implemented)
CHAPTER 3: Worker well-being in lean SMEs (motivational and health-impairment process)	Discover how various job characteristics (job resources and job demands) affect different worker outcomes (work engagement, exhaustion and job performance) of FLEs in lean SMEs	Quantitative questionnaire study with 273 questionnaires filled out by FLEs from seven different Croatian and Slovene lean SMEs; SEM analysis	- communication enhances work engagement - organisational cultural change, lack of resources and problem-solving deplete worker energy - increased motivational outcomes positively impact job performance - no apparent connection between exhaustion and job performance - problem-solving does not increase work engagement and alleviate exhaustion	We confirm the basic postulates of the JD-R model and expand it to see how it reflects FLE job performance (besides work engagement and exhaustion)	- research is limited to the production industry - included only Croatian and Slovene lean SMEs - only mature lean cases are included in the research - only several job characteristics are included out of many considered - cross-sectional study, we can't conclude on causality

Source: own work.

4.3 Interpretation of the results

The basis of our research was expanding the theory behind lean management and enabling further development of the methodology. Our first focus was on SMEs and their specifics in lean use. Additionally, we focused primarily on FLEs inside lean SMEs to identify their specific role in lean and how lean impacts their well-being. Therefore, our research has three layers: focus on lean SMEs (1), focus on FLEs roles inside lean SMEs (2) and specifically, focus on the well-being of those FLEs in lean SMEs (3).

This dissertation creates a comprehensive overview of FLE roles in lean SMEs to allow for successful implementation in SMEs. To succeed in lean use, lean job design in SMEs should consider the consequences of lean use on FLE well-being. SMEs' FLEs are, to a greater extent, overburdened by routine operational activities, reducing their readiness and commitment to long-term improvement (Kumar et al., 2006; Rymaszewska, 2014; Shokri et al., 2016). Moreover, some peculiarities of SMEs, such as job insecurity, poor communication, and lower promotion opportunities, introduce additional challenges for the lean employees (Achanga et al., 2006; AlManei et al., 2017; Hu et al., 2015; Lande et al., 2016). Hence, existing research reports many adverse health (cardiovascular diseases and musculoskeletal disorders) and well-being effects (job stress, monotony, and exhaustion) of FLEs in SMEs (Hasle et al., 2012; Landsbergis, Cahill & Schnall, 1999; Pearce et al., 2018). Evidence is rare concerning the importance of FLEs' behavioural attitudes in lean applications (Hines et al., 2011; Losonci et al., 2011; Ramadas & Satish, 2018). One possible reason might be the extensive focus on measuring operational and financial performance instead of on employee behavioural changes.

We identify many factors influencing the role of FLEs in lean SMEs, starting from their characteristics (intrinsic motivation, creativity, confidence, knowledge and skills, etc.) to the cultural factors changing due to lean implementation (teamwork, lean awareness programs, engagement), relations with management (communication, support, management commitment) and the lean job design itself (the intensity of work in lean, complexity, appraisal and rewards programs). We expand the map on FLEs in lean SMEs by sorting the FLE roles in positive or negative lean SME job characteristics through job resources, challenge job demands and hindrance job demands.

Some aspects of lean remain the same regardless of the company size. Related to our topic, the engagement of people in lean remains of the same importance, irrespective of the context – be it SMEs or LEs. However, there are propositions in the literature claiming lean methodology is used differently in SMEs and LEs (Siegel et al., 2019; Yadav, Jain, Mittal, Panwar, & Sharma, 2019), with notable differences in the effects of employee-related social practices on lean. Size is important when implementing lean tools (Koloszar, 2018). A flatter SME organisational structure also suggests that FLEs pursue continuous improvement opportunities without seeking approval from higher levels (Yadav, Jain, Mittal, Panwar, & Lyons, 2019b).

4.3.1 Motivational elements of lean SMEs for FLEs

It seems FLEs in lean SMEs are motivated by rewards and recognition, good work organisation, experience and autonomy, support and good information management and communication. Praise, good pay, and job benefits are recognised overall as good stimulation for a job well done (V. Wickramasinghe & Wickramasinghe, 2016), and similar is true for FLEs in lean SMEs as well. However, in lean SMEs, stimulation for improvement ideas is empowering and should be further encouraged. Building on continuous improvement is the fundamental postulate of lean philosophy, which relies on FLEs and their shop-level knowledge (Choi et al., 1997). Since they work on a part of the process with repetitive activities, they rely on experience and previous trials and errors to work more efficiently. That is why autonomy is significant and motivates them since it allows for a more effortless production flow. This is especially possible in SMEs, which have a less rigid structure and can give more freedom to FLEs. However, surprisingly, management expects FLE contribution but still holds on to official procedures and standardisation, which diminishes worker autonomy.

Another motivational job resource mentioned in literature and through interviews is support from management, immediate supervisors and colleagues. FLEs most often reflect on support from peers and immediate supervisors since the support from higher management is not that visible to them. In lean SMEs, support can be shown through lean training and quick resolution of production issues, increasing FLE motivation and engagement. Furthermore, when done right, information management and communication engage employees since they have the information to do their daily tasks efficiently and effectively. Enabling easier communication may lead to higher creativity on the tasks FLEs are assigned to. It strengthens work engagement in FLEs in lean SMEs, which may significantly contribute to lean development since formal systems/tools exist to ease the development of ideas in workers (e.g. kaizen, A3, and similar). FLEs possess great potential for innovation in the workplace, which is, to a great extent, unknown to middle and top management (Engen & Magnusson, 2015). Management must ensure adequate surroundings to enhance their potential and enable them to express themselves freely through adequate communication channels.

Good organisation and straightforward tasks also motivate FLEs, enabling them to find solutions faster and solve problems more efficiently with a straightforward reporting process. The existence of formal channels, a clear overview of the decision-making processes in the organisation, adaptation to strict process requirements, adequate delegation of resources and the ability to implement management decisions at the first level are expected to engage and motivate workers. However, since SMEs usually employ simple operational planning and control systems (Ates & Bititci, 2011; O'Reilly et al., 2015), it may lead to a lack of systematic procedures (Yadav, Jain, Mittal, Panwar, & Lyons, 2019b), so FLEs are more worried and strained since the system is susceptible to quick changes. SMEs focus more on short-term solutions than long-term lean benefits (Achanga et al., 2006). SMEs have more informal procedures than LEs, so some elements of good work

organisation (such as a clear overview of processes) may be lacking, which may be why lean SME FLEs show a negative relationship between good work organisation and work engagement.

Our focus on FLEs also shows that problem-solving does not provide the motivational challenge which would increase their work engagement. Lean tools generally force FLEs to be constantly involved and seek underlying causes of problems. However, fixing root causes typically requires collective effort, exiting the comfort zone and acquiring new skills (Deming, 2018), which all drain energy from employees and do not offer immediate rewards. SMEs also employ FLEs with lower skill levels, which do not have the mindset of skill enhancement (Achanga et al., 2006). This may be why they do not find problem-solving motivating and engaging. Moreover, we found that problem-solving has a positive relationship with exhaustion.

4.3.2 Health-impairing elements of lean SMEs for FLEs

While many aspects of lean SMEs invigorate, motivate, and engage workers, some elements can deplete their energy and have adverse health effects. The lack of knowledge and expertise in lean methodology can be frustrating for FLEs, as it limits their potential in the production process. Some FLEs may not even realize that they are working with lean tools or using a lean methodology, leading to exhaustion as management demands additional job elements without clear explanations. Furthermore, the continuous unveiling of process deficiencies by lean can leave employees feeling unequipped and drained.

The changes in organisational culture may also negatively affect worker well-being. They include differences in routine or job responsibilities in lean implementation and fear of adverse changes in the company (financial loss, loss of status or the job, adding responsibilities). FLEs do not recognise resistance, but it is evident from the management standpoint. New programs and changes introduced as a part of lean philosophy aim to improve productivity and efficiency, but they lead to increased FLE exhaustion (Choi et al., 1997). Getting used to new routines and job responsibilities is taxing to workers, and this causes exhaustion. Quantitative analysis also confirmed this, finding a strong positive relationship between organisational cultural change and exhaustion.

Although information management and communication are identified as job resources, problems with information flow occur in lean, too, and they are strenuous to FLEs. Although our focus was lean SMEs, where we expected a less strict structure and closer communication between workers and management, we found a formalised system similar to LEs, where workers are limited in expressing their ideas and communicating problems to higher management. When researching for potential companies participating in our research, our search companies discovered mainly medium companies which had more than 100 employees. Smaller companies did not enter our inclusion criteria, having lean implemented only recently or with too few tools to be able to participate. Through informal

communication with managers of such companies, we discovered lean tools are helpful but impractical to implement in full in such companies. Only when a company surpasses a certain number of employees and profits can they think about systematically introducing such a methodology in full. Such complete implementation includes consultants and employing people working specifically on lean, which also requires funds smaller companies cannot allocate.

The limited availability of resources is a prominent hindrance job demand for workers. This is particularly true in lean SMEs known for lacking funding (Panizzolo et al., 2012), underdeveloped processes and quality control systems (Alkhoraif et al., 2019), all of which signify limited resources for FLEs. LEs have more internal resources to enable learning, like learning and development specialists (Strange, 2012). In contrast, SMEs rarely have these resources focused on employee learning available. Workers often have to improvise on the job, and disruptions in the production process cause frustration, which makes FLEs lose motivation. This was suggested through our quantitative analysis, with a strong positive influence of limited availability of resources on exhaustion.

Poor production planning is another burdening element of lean SMEs. Although lean requires a systematic approach to production, we found poor production planning and organisation to be a significant source of stress for FLEs. Work overload appears, and FLEs are expected to cover for one another since support doesn't come at the right time. There are also interruptions in the production process from management due to customer requirements, which are specific to flexible and responsive SMEs.

Several studies confirm a positive relationship between employee work engagement and job performance (Bakker et al., 2012; Demerouti et al., 2010; Halbesleben & Bowler, 2007; Salanova et al., 2005; Xanthopoulou et al., 2009), and also explicitly targeting FLEs (Ghlichlee & Bayat, 2021; Karatepe, 2011a; Karatepe & Aga, 2012; "Miracle" Qi et al., 2018). Job performance represents the extent to which employees meet or exceed the expectations of their organisational roles. We provide evidence for the same relationship in the case of FLEs in lean SMEs, suggesting they also have higher job performance when they are more engaged in their work. We did not find a negative significant relationship between exhaustion and job performance in lean SME FLEs. However, the decrease in job performance is most commonly presented as a negative consequence of exhaustion (Halbesleben & Buckley, 2004; Maslach, 2003). In their research, Halbesleben & Bowler (2007) propose that the relationship between emotional exhaustion and job performance should be mediated and that motivation mediates the relationship between emotional exhaustion and job performance.

4.4 Limitations and future research avenues

We thoroughly examined each study's limitations in its respective chapters and consolidated them in Table 22. This comprehensive review of the dissertation's general limitations not

only informs the reader but also paves the way for future research opportunities based on these limitations.

The main limitation of this study is time constraints, which do not allow for longitudinal research of job design and worker outcomes in lean SMEs. A longitudinal study is a recommendation for future research regarding this topic. Moreover, as usual in case study research, it is possible that by choosing specific companies, we may omit some job demands or resources used in other lean SMEs, which may affect worker performance, engagement, and exhaustion. Since only a few SMEs participated in this research, we cannot make general assumptions about all lean SMEs.

Exploring the relationship between management and FLEs, and the differences in their expectations and viewpoints on lean, is a crucial area for future research. Understanding these dynamics can significantly enhance the success of lean implementation in SMEs. While it's commonly believed that the distance between management and FLEs is closer in SMEs, our findings suggest that this closeness is not fully utilized to improve lean use in the company. This underscores the need for further research to discover better ways of understanding and leveraging the relationship between management and FLEs.

FLE attitude, motivation, training and education, and skills and expertise variables may vary depending on the region in which a study is conducted (Qureshi et al., 2022). This research was done in Croatian and Slovenian lean SMEs, so we should know the national context. We also call on other researchers to confirm our findings in other national contexts.

This study included only mature lean SMEs. Due to the varying nature of lean implementation phases (different lean use in various lean phases, industry type, level of employee involvement, etc.) (Beraldin et al., 2019; Conti et al., 2006; Cullinane et al., 2014; Hasle et al., 2012; Parker, 2003) we call on additional research to explore the well-being of FLEs in various lean cases.

4.5 Theoretical contribution

Our findings make a significant theoretical contribution by deepening the understanding of FLEs in lean SMEs. This study is the first to focus exclusively on FLEs within this context, offering a more comprehensive perspective on their role in successful lean implementation. By identifying and categorizing key FLE-related factors—job resources, challenge job demands, and hindrance job demands—we provide a structured framework for enhancing lean adoption in SMEs. Additionally, this research integrates lean theory with the JD-R model, demonstrating how lean-specific practices influence employee engagement, exhaustion, and job performance. This interdisciplinary approach advances lean theory by linking operational principles to human factors, providing both researchers and practitioners with a nuanced framework for designing lean systems that maximize employee potential while mitigating operational risks.

4.6 Recommendations for implementation – practical contribution

The results from this PhD research significantly enhance the understanding of the importance of workplace design for FLE well-being, particularly in the context of SMEs that have adopted lean management principles. The findings underscore the need for SMEs to consider the impact of job design on FLE well-being when implementing lean practices.

A range of practices and initiatives can be used to support worker well-being in lean SMEs. Implementing a rewards and recognition system, providing good work organisation and adequate support, and relying on worker experience and autonomy can help achieve higher worker well-being. Additionally, lean SMEs can create a positive work environment by promoting open, clear communication and adequately encouraging and rewarding FLE contribution and participation in decision-making processes.

We found that problem-solving as a challenge job demand does not positively affect work engagement and exhaustion. We suggest the job be designed so that FLEs have enough time to think about the occurring problems. The goal is not to rush and complete a certain amount of products within the deadline, but the workers should be given space to solve problems. In addition to pressing problems that need to be solved urgently for production to continue, employees need time to solve general problems that would enable better results for the company in the long run and positively affect the well-being of employees. What is more, we encourage greater emphasis on small ideas from FLEs. They can lift the FLE motivation since they are generally easier to implement, do not have to be very formal, and FLEs can generate a larger amount of them (Robinson & Schroeder, 2009; Salma et al., 2021).

Providing first-line employees with the tools and resources to manage production effectively is crucial. This can include access to real-time data, problem-solving tools, and communication systems, allowing them to respond to issues and make improvements quickly. Communication is a crucial factor for successful lean implementation. We suggest that lean SMEs use the flatter organisational structure to their advantage to increase and improve communication between senior management and FLEs.

SMEs should recognise their drawbacks and use them to their advantage. While they are still small and flexible, they can give workers more autonomy and flexibility instead of turning to standard work. Smaller enterprises do not formalise their procedures that much, which means lean is not formalised but rather implemented spontaneously as a set of tools. In order to fully explore the benefits of lean, SMEs should focus on formalising improvement routines, stimulating FLEs to be proactive on the shop floor and ensuring they fully understand lean efforts (Knol et al., 2019). What is more, strategic-level management ideas should be explained and adjusted accordingly so that FLEs understand the requirements of higher levels (Robinson & Schroeder, 2009).

The adapted and adjusted JD-R model, a widely used framework in occupational health psychology, can serve as a diagnostic tool to understand the impact of job design on worker

outcomes in lean SMEs. By identifying the balance between job demands and job resources, this model can help create a lean SME job design that is beneficial to both the organization and FLEs. Using our presented framework, management can review the impacts of lean SME job resources and demands, organizing it around FLEs specifically. We found that communication is a valuable job resource to FLEs, stimulating their work engagement in lean SMEs. On the other hand, problem-solving, organizational cultural changes, and limited resource availability threaten worker well-being, exhausting them. FLEs usually have demanding, monitored work, which is likely a threat to their health, and this risk needs to be reduced so FLE roles can be more sustainable and lead to higher job performance.

5 CONCLUSION

Companies are constantly looking to improve their performance and increase profits. However, these efforts can sometimes come at the expense of employees' overall health and job satisfaction. In this dissertation, we try to find job characteristics in lean SMEs that motivate FLEs in their work and enhance their work engagement, as well as job characteristics that deplete their energy, concluding on their job performance. We summarise the main findings, present practical and theoretical contributions and discuss the limitations of our research.

The systematic overview of the literature followed by qualitative and quantitative approaches to the exploration of job characteristics (job demands and job resources) on FLEs in lean SMEs enabled the discovery and confirmation of job characteristics in this specific environment, adding to the theory of the JD-R model and providing managers with practical advice on health and motivational outcomes of lean practices on FLEs when implemented in SMEs. These discovered job characteristics evolve from previously discovered elements of the JD-R model developed and continuously updated by various scientists. They are specific to lean SMEs and can be used in companies facing contextual variables similar to this dissertation.

This study summarised the role of FLEs in lean SMEs by identifying factors and themes surrounding their roles in lean SMEs, further identifying job characteristics that influence their overall work conditions, and confirming how selected job characteristics affect work engagement, exhaustion and job performance. This dissertation rounded off the story of FLEs in that specific context. It emphasised their importance and what should be paid attention to when making changes or implementing lean in a specific context. As we emphasised throughout the dissertation, the importance of FLEs for the success of lean and the entire production in SMEs is inevitable. Hence, this dissertation helps guide managers, policymakers, and lean enthusiasts to which areas they should pay attention to in lean implementation to enable satisfied, motivated, and healthy workers with high job performance and contribute to the work and development of SMEs.

Our review of the literature revealed that studies examining the connection between lean practices and employee health outcomes remain inconsistent (Bouville & Alis, 2014; Erdil et al., 2018) with less focus on qualitative research (Anuar et al., 2022). Moreover, evidence on the effect of lean on employees' physical and psychological health is both conflicting and insufficient (Hasle et al., 2012; Ulhassan et al., 2014). Stenfors-Hayes et al. (2016) suggest combining the lean perspective with insights from research on employee health and job satisfaction. This dissertation aimed to cover a part of this gap, exploring the worker outcomes of FLEs in lean SMEs. It offered valuable and practical insights into the appropriate design of lean processes in SMEs that engage workers, enhance their motivation and reduce the harmful health-impairment elements of job characteristics. This dissertation also responded to calls to clarify the effects of lean on employee job satisfaction and health (Hasle, 2014).

When an SME decides to implement lean to enhance productivity in the company, management must be aware of the changes in job requirements for FLEs. SMEs can be more adaptable and flexible, reacting faster to employee needs, which is more difficult for LEs (Antony 2016, Darcy 2014, O'regan 2004). Our findings demonstrate that the lean environment in SMEs is a demanding and resourceful work environment all at once. It has engaging and exhausting elements, which FLEs must carefully balance. The impacts of lean job characteristics depend on how the risks in job demands are calculated and how job resources are used to address those risks. This study supports previous research on the JD-R model demonstrating the health-impairing role of job demands (in our case, limited availability of resources, organisational cultural change and problem-solving) and motivational role of job resources (communication and good work organisation) (Conti et al., 2006; Cullinane et al., 2014; Jackson & Mullarkey, 2000). We agree with the foundational postulate of the JD-R model, claiming that lean job demands should be minimised and lean resources maximised to promote a positive work environment in SMEs.

The findings from this dissertation enable us to propose further development of the existing theory on the JD-R model stemming from the specifics of SMEs. Our objective was to test and confirm the JD-R model in the lean SME environment, focusing on FLEs. This study shows how the JD-R model may serve as an analytical tool examining the impact of various job demands and resources on employee exhaustion, work engagement and, ultimately, job performance. Building from a qualitative analysis, where we identified JD and JR specific to first-line employees in a lean SME setting, we quantitatively tested potential drivers of different worker outcomes (Bakker et al., 2016; Huo & Boxall, 2017b). With this, managers can review the impacts of job demands imposed on workers and the job resources they provide to better the job performance of workers.

In conclusion, maintaining a health, engaged and satisfied workforce is a critical factor for SME success. SMEs need to prioritise the overall health and job satisfaction of their employees. By implementing supportive practices and creating a positive work environment, SMEs can enhance FLE engagement and overall health, which, in turn, can lead to increased

job satisfaction, motivation, and productivity. Although there is no pre-determined outcome for overall work conditions of FLEs in lean SMEs, the ultimate effects depend on how risks associated with job demands are evaluated and how lean SME job resources are mobilised to counteract them. The main idea behind the research is to find the balance between job demands and job resources to create a lean job design in SMEs that is beneficial to both the organisation and its employees. Through our research, we proved that in SMEs, despite their difficulties, it is possible to design lean so that employees are satisfied, engaged, and committed to their roles.

REFERENCE LIST

1. Abbass Shah, Z., & Hussain, H. (2016). *An investigation of lean manufacturing implementation in textile industries of Pakistan*. 668–677. Scopus. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85018971816&partnerID=40&md5=e2c6686d2b9f80f34098815bcdae5580
2. Abdul Hamid, R. B., Ismail, M. D. B., & Ismail, I. R. B. (2020). Importance of Employee Participation in Lean Thinking and Their Competency Towards Employee Innovative Behaviour. *The South East Asian Journal of Management*, *14*(1). https://doi.org/10.21002/seam.v14i1.11836
3. Abdulmalek, F. A., Rajgopal, J., & Needy, K. L. (2006). A Classification Scheme for the Process Industry to Guide the Implementation of Lean. *Engineering Management Journal*, *18*(2), 15–25. https://doi.org/10.1080/10429247.2006.11431690
4. Abolhassani, A., Layfield, K., & Gopalakrishnan, B. (2016). Lean and US manufacturing industry: Popularity of practices and implementation barriers. *International Journal of Productivity and Performance Management*, *65*(7), 875–897. https://doi.org/10.1108/IJPPM-10-2014-0157
5. Abreu-Ledón, R., Luján-García, D. E., Garrido-Vega, P., & Escobar-Pérez, B. (2018). A meta-analytic study of the impact of Lean Production on business performance. *International Journal of Production Economics*, *200*, 83–102. https://doi.org/10.1016/j.ijpe.2018.03.015
6. Abu Aisheh, Y. I., Tayeh, B. A., Alaloul, W. S., & Almalki, A. (2022). Health and safety improvement in construction projects: A lean construction approach. *International Journal of Occupational Safety and Ergonomics*, *28*(4), 1981–1993.
7. Abu, F., Gholami, H., Mat Saman, M. Z., Zakuan, N., & 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
8. Achanga, P., Shehab, E., Roy, R., & Nelder, G. (2006). Critical success factors for lean implementation within SMEs. *Journal of Manufacturing Technology Management*, *17*(4), 460–471. https://doi.org/10.1108/17410380610662889
9. Adam, E. E., Corbett, L. M., Flores, B. E., Harrison, N. J., Lee, T., Rho, B., Ribera, J., Samson, D., & Westbrook, R. (1997). An international study of quality improvement approach and firm performance. *International Journal of Operations & Production Management*.
10. Adam, M., Hofbauer, M., & Stehling, M. (2020). Effectiveness of a lean simulation training: Challenges, measures and recommendations. *Production Planning & Control*, 1–11. https://doi.org/10.1080/09537287.2020.1742375
11. Afsar, B., & Masood, M. (2018). Transformational leadership, creative self-efficacy, trust in supervisor, uncertainty avoidance, and innovative work behavior of nurses. *The Journal of Applied Behavioral Science*, *54*(1), 36–61.

12. Åhlström, P., & Karlsson, C. (1996). Change processes towards lean production. *International Journal of Operations & Production Management*, *16*(11), 42–56. https://doi.org/10.1108/01443579610131447
13. Ahuja, I. P. S., & Khamba, J. S. (2008). Total productive maintenance: Literature review and directions. *International Journal of Quality & Reliability Management*.
14. Akkermans, J., Schaufeli, W. B., Brenninkmeijer, V., & Blonk, R. W. B. (2013). The role of career competencies in the Job Demands—Resources model. *Journal of Vocational Behavior*, *83*(3), Article 3. https://doi.org/10.1016/j.jvb.2013.06.011
15. Alarcon, G. M. (2011). A meta-analysis of burnout with job demands, resources, and attitudes. *Journal of Vocational Behavior*, *79*(2), Article 2.
16. Alefari, M., Almanei, M., & Salonitis, K. (2020). Lean manufacturing, leadership and employees: The case of UAE SME manufacturing companies. *Production & Manufacturing Research*, *8*(1), 222–243. https://doi.org/10.1080/21693277.2020.1781704
17. Alefari, M., Salonitis, K., & Xu, Y. (2017). The Role of Leadership in Implementing Lean Manufacturing. *Procedia CIRP*, *63*, 756–761. https://doi.org/10.1016/j.procir.2017.03.169
18. Alhuraish, I., Robledo, C., & Kobi, A. (2017). A comparative exploration of lean manufacturing and six sigma in terms of their critical success factors. *Journal of Cleaner Production*, *164*, 325–337. https://doi.org/10.1016/j.jclepro.2017.06.146
19. Ali Yame, A., & Al-Werfalli, D. (2016). Applications of lean methodologies and quality improvement in textile industry. *Proceedings of the International Conference on Industrial Engineering and Operations Management*, 624–631. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85018986139&partnerID=40&md5=31cc9191eb8ed747bac08923571f2dc9
20. Alkhoraif, A., & McLaughlin, P. (2018a). Lean implementation within manufacturing SMEs in Saudi Arabia: Organizational culture aspects. *Journal of King Saud University - Engineering Sciences*, *30*(3), 232–242. https://doi.org/10.1016/j.jksues.2018.04.002
21. Alkhoraif, A., & McLaughlin, P. (2018b). Organisational culture aspects that facilitate lean implementation: A pilot study. *International Journal of Agile Systems and Management*, *11*(2), 103–125. Scopus. https://doi.org/10.1504/IJASM.2018.092543
22. Alkhoraif, A., Rashid, H., & McLaughlin, P. (2019). Lean implementation in small and medium enterprises: Literature review. *Operations Research Perspectives*, *6*, 100089. https://doi.org/10.1016/j.orp.2018.100089
23. AlManei, M., Salonitis, K., & Xu, Y. (2017). Lean Implementation Frameworks: The Challenges for SMEs. *Manufacturing Systems 4.0 – Proceedings of the 50th CIRP Conference on Manufacturing Systems*, *63*, 750–755. https://doi.org/10.1016/j.procir.2017.03.170
24. Al-Najem, M., Dhakal, H., & Bennett, N. (2012). The role of culture and leadership in lean transformation: A review and assessment model. *International Journal of Lean Thinking*, *3*(1), 119–138.

25. Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M. (1996). Assessing the work environment for creativity. *Academy of Management Journal*, *39*(5), 1154–1184.
26. Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin*, *103*(3), Article 3. https://doi.org/10.1037/0033-2909.103.3.411
27. Anderson, J. C., Rungtusanatham, M., & Schroeder, R. G. (1994). A theory of quality management underlying the Deming management method. *Academy of Management Review*, *19*(3), 472–509.
28. Anderson-Connolly, R., Grunberg, L., Greenberg, E. S., & Moore, S. (2002). Is Lean Mean?: Workplace Transformation and Employee Well-being. *Work, Employment and Society*, *16*(3), 389–413. https://doi.org/10.1177/095001702762217407
29. Andersson, R., Eriksson, H., & Torstensson, H. (2006). Similarities and differences between TQM, six sigma and lean. *The TQM Magazine*, *18*(3), 282–296. https://doi.org/10.1108/09544780610660004
30. Andrew, O. C., & Sofian, S. (2012). Individual factors and work outcomes of employee engagement. *Procedia - Social and Behavioral Sciences*, *40*, 498–508.
31. Angelis, J., Conti, R., Cooper, C., & Gill, C. (2011). Building a high-commitment lean culture. *Journal of Manufacturing Technology Management*, *22*(5), 569–586. https://doi.org/10.1108/17410381111134446
32. Antomarioni, S., Bevilacqua, M., Ciarapica, F. E., De Sanctis, I., & Ordieres-Meré, J. (2020). Lean projects' evaluation: The perceived level of success and barriers. *Total Quality Management & Business Excellence*, 1–25. https://doi.org/10.1080/14783363.2020.1731301
33. Antony, J., Vinodh, S., & Gijo, E. (2017). *Lean Six Sigma for small and medium sized enterprises: A practical guide*. CRC Press.
34. Antosz, K., & Stadnicka, D. (2017). Lean Philosophy Implementation in SMEs – Study Results. *Procedia Engineering*, *182*, 25–32. https://doi.org/10.1016/j.proeng.2017.03.107
35. Anuar, A., Saad, R., Yusoff, R. Z., & Sadek, D. M. (2019). Lean healthcare practices and operational performance: Safety climate as a moderator. *International Journal of Supply Chain Management*, *8*(4), 16–21.
36. Anuar, A., Sadek, D. M., Rahman, N. L. A., Mamat, R. C., & Marwan, N. F. (2022). The Understanding of Lean Practices and Well-being Harmonization in Malaysian SMEs. *International Journal of Accounting, Finance and Business*, *7*(39), Article 39.
37. Appelbaum, E., Bailey, T., Berg, P., Kalleberg, A. L., & Bailey, T. A. (2000). *Manufacturing advantage: Why high-performance work systems pay off*. Cornell University Press.
38. Arabi, S., Bajjou, M. S., Chafi, A., & El Hammoumi, M. (2022). Evaluation of critical success factors (CSFs) to lean implementation in Moroccan SMEs: A survey study. *2022 2nd International Conference on Innovative Research in Applied Science, Engineering and Technology (IRASET)*, 1–10. https://doi.org/10.1109/IRASET52964.2022.9737950

39. Aragón, M. V. D.-L.-F., & Ros-McDonnell, L. (2015). Implementing a lean production system on a food company: A case study. *International Journal of Engineering Management and Economics*, *5*(1–2), 129–142.
40. Arevalo-Barrera, B. C., Parreno-Marcos, F. E., Quiroz-Flores, J. C., & Alvarez-Merino, J. C. (2019). Waste Reduction Using Lean Manufacturing Tools: A Case in the Manufacturing of Bricks. *IEEE International Conference on Industrial Engineering and Engineering Management*, 1285–1289. https://doi.org/10.1109/IEEM44572.2019.8978508
41. Armenakis, A. A., Harris, S. G., & Mossholder, K. W. (1993). Creating readiness for organizational change. *Human Relations*, *46*(6), 681–703.
42. Arumugam, V., Kannabiran, G., & Vinodh, S. (2020). Impact of technical and social lean practices on SMEs' performance in automobile industry: A structural equation modelling (SEM) analysis. *Total Quality Management & Business Excellence*, 1–27. https://doi.org/10.1080/14783363.2020.1791067
43. Assarlind, M. (2015). Analysis of an improvement programme for MMEs. *Journal of Manufacturing Technology Management*, *26*(8), 1107–1125. https://doi.org/10.1108/JMTM-04-2013-0044
44. Atatsi, E. A., Stoffers, J., & Kil, A. (2019). Factors affecting employee performance: A systematic literature review. *Journal of Advances in Management Research*, *16*(3), 329–351. https://doi.org/10.1108/JAMR-06-2018-0052
45. Ates, A., & Bititci, U. (2011). Change process: A key enabler for building resilient SMEs. *International Journal of Production Research*, *49*(18), 5601–5618.
46. Ates, A., Garengo, P., Cocca, P., & Bititci, U. (2013). The development of SME managerial practice for effective performance management. *Journal of Small Business and Enterprise Development*, *20*(1), 28–54. https://doi.org/10.1108/14626001311298402
47. Azizi, A., & Aikhuele, D. O. (2015). An integrated model of Kano and quality function deployment for evaluation of lean production tools in assembly environment. *2015 International Conference on Industrial Engineering and Operations Management (IEOM)*, 1–6. https://doi.org/10.1109/IEOM.2015.7228097
48. Bäckström, I., & Ingelsson, P. (2016). Measuring Appreciative Inquiry, Lean and Perceived Co-worker Health. *Quality Innovation Prosperity*, *20*(2), 105. https://doi.org/10.12776/qip.v20i2.744
49. Baeriswyl, S., Krause, A., & Schwaninger, A. (2016). Emotional Exhaustion and Job Satisfaction in Airport Security Officers – Work–Family Conflict as Mediator in the Job Demands–Resources Model. *Frontiers in Psychology*, *7*. https://doi.org/10.3389/fpsyg.2016.00663
50. Bagley, A., & Lewis, E. (2008). *Debate: Why Aren't We All Lean?*
51. Bakås, O., Govaert, T., & Van Landeghem, H. (2011). *Challenges and success factors for implementation of lean manufacturing in European SMES. 1*.

52. Bakker, A. B., & Demerouti, E. (2007). The Job Demands-Resources model: State of the art. *Journal of Managerial Psychology*, *22*(3), 309–328. https://doi.org/10.1108/02683940710733115
53. Bakker, A. B., & Demerouti, E. (2017). Job demands–resources theory: Taking stock and looking forward. *Journal of Occupational Health Psychology*, *22*(3), 273–285. https://doi.org/10.1037/ocp0000056
54. Bakker, A. B., Demerouti, E., & Sanz-Vergel, A. I. (2014). Burnout and Work Engagement: The JD–R Approach. *Annual Review of Organizational Psychology and Organizational Behavior*, *1*(1), 389–411. https://doi.org/10.1146/annurev-orgpsych-031413-091235
55. Bakker, A. B., Demerouti, E., Taris, T. W., Schaufeli, W. B., & Schreurs, P. J. (2003). A multigroup analysis of the job demands-resources model in four home care organizations. *International Journal of Stress Management*, *10*(1), 16.
56. Bakker, A. B., Demerouti, E., & Verbeke, W. (2004). Using the job demands-resources model to predict burnout and performance. *Human Resource Management*, *43*(1), 83–104. https://doi.org/10.1002/hrm.20004
57. Bakker, A. B., Hakanen, J. J., Demerouti, E., & Xanthopoulou, D. (2007). Job resources boost work engagement, particularly when job demands are high. *Journal of Educational Psychology*, *99*(2), 274–284. https://doi.org/10.1037/0022-0663.99.2.274
58. Bakker, A. B., Oerlemans, W. G., & Ten Brummelhuis, L. L. (2016). Becoming fully engaged in the workplace: What individuals and organizations can do to foster work engagement. In *The fulfilling workplace* (pp. 55–70). Routledge.
59. Bakker, A. B., Schaufeli, W. B., Leiter, M. P., & Taris, T. W. (2008). Work engagement: An emerging concept in occupational health psychology. *Work & Stress*, *22*(3), 187–200. https://doi.org/10.1080/02678370802393649
60. Bakker, A. B., Tims, M., & Derks, D. (2012). Proactive personality and job performance: The role of job crafting and work engagement. *Human Relations*, *65*(10), 1359–1378.
61. Bamber, G. J., Stanton, P., Bartram, T., & Ballardie, R. (2014). Human resource management, Lean processes and outcomes for employees: Towards a research agenda. *The International Journal of Human Resource Management*, *25*(21), 2881–2891. https://doi.org/10.1080/09585192.2014.962563
62. Bandara, W., Furtmueller, E., Gorbacheva, E., Miskon, S., & Beekhuyzen, J. (2015). Achieving rigor in literature reviews: Insights from qualitative data analysis and tool-support. *Communications of the Association for Information Systems*, *37*(1), 8.
63. Bayo-Moriones, A., Bello-Pintado, A., & Merino-Díaz-de-Cerio, J. (2008). The role of organizational context and infrastructure practices in JIT implementation. *International Journal of Operations & Production Management*, *28*(11), 1042–1066. https://doi.org/10.1108/01443570810910188
64. Belhadi, A., Sha'ri, Y. B. M., Touriki, F. E., & El Fezazi, S. (2018). Lean production in SMEs: Literature review and reflection on future challenges. *Journal of Industrial and*

Production Engineering, *35*(6), 368–382. https://doi.org/10.1080/21681015.2018.1508081

65. Belhadi, A., & Touriki, F. E. (2016). A framework for effective implementation of lean production in small and medium-sized enterprises. *Journal of Industrial Engineering and Management*, *9*(3), 786–810.
66. Belhadi, A., Touriki, F. E., & Elfezazi, S. (2019). Evaluation of critical success factors (CSFs) to lean implementation in SMEs using AHP. *International Journal of Lean Six Sigma*, *10*(3), 803–829. https://doi.org/10.1108/IJLSS-12-2016-0078
67. Belhadi, A., Touriki, F. E., & Fezazi, S. E. (2016). Road map for the implementation of lean production tools in SMEs. *Proceedings of the International Conference on Industrial Engineering and Operations Management*, *8-10 March 2016*, 340–348. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85018394098&partnerID=40&md5=64beca52abee34e09f78a33e531c2cfe
68. Bendell, T. (2005). Structuring business process improvement methodologies. *Total Quality Management and Business Excellence*, *16*(8–9), 969–978.
69. Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, *107*(2), 238.
70. Beraldin, A. R., Danese, P., & Romano, P. (2019). An investigation of the relationship between lean and well-being based on the job demands-resources model. *International Journal of Operations & Production Management*, *39*(12), Article 12. https://doi.org/10.1108/IJOPM-05-2019-0377
71. Berggren, C. (1993). *Alternatives to lean production: Work organization in the Swedish auto industry* (Issue 22). Cornell University Press.
72. Bergquist, B., & Westerberg, M. (2014). Testing for motivation to engage in improvements – a conceptual framework and an initial empirical test. *Total Quality Management & Business Excellence*, *25*(11–12), 1224–1235. https://doi.org/10.1080/14783363.2013.776761
73. Berisha, G., & Pula, J. S. (2015). Defining Small and Medium Enterprises: A critical review. *Academic Journal of Business, Administration, Law and Social Sciences*, *1*(1), 17–28.
74. Bhamu, J., & Singh Sangwan, K. (2014). Lean manufacturing: Literature review and research issues. *International Journal of Operations & Production Management*, *34*(7), 876–940. https://doi.org/10.1108/IJOPM-08-2012-0315
75. Bhasin, S., & Burcher, P. (2006). Lean viewed as a philosophy. *Journal of Manufacturing Technology Management*, *17*(1), 56–72. https://doi.org/10.1108/17410380610639506
76. Bianchi, C., Winch, G., & Cosenz, F. (2018). Experimenting lean dynamic performance management systems design in SMEs. *International Journal of Productivity and Performance Management*.
77. Bilotta, I., Cheng, S., Davenport, M. K., & King, E. (2021). Using the job demands-resources model to understand and address employee well-being during the COVID-19

pandemic. *Industrial and Organizational Psychology*, *14*(1–2), Article 1–2. https://doi.org/10.1017/iop.2021.43

78. Bocquet, R., Dubouloz, S., & Chakor, T. (2019). Lean Manufacturing, Human Resource Management and Worker Health: Are there Smart Bundles of Practices along the Adoption Process? *Journal of Innovation Economics & Management*, *n°30*(3), 113. https://doi.org/10.3917/jie.pr1.0050
79. Bonavia, T., & Marin-Garcia, J. A. (2011). Integrating human resource management into lean production and their impact on organizational performance. *International Journal of Manpower*.
80. 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
81. Bouville, G., & Alis, D. (2014). The effects of lean organizational practices on employees' attitudes and workers' health: Evidence from France. *The International Journal of Human Resource Management*, *25*(21), 3016–3037. https://doi.org/10.1080/09585192.2014.951950
82. Bouville, G., & Schmidt, C. (2019). Decoupling and essential effects of lean management on job satisfaction, health and depression. A mixed methods approach. *Revue de Gestion Des Ressources Humaines*, *114*(4), 3–30.
83. Boxall, P., & Macky, K. (2007). High-performance work systems and organisational performance: Bridging theory and practice. *Asia Pacific Journal of Human Resources*, *45*(3), 261–270.
84. Boyle, T. A., & Scherrer-Rathje, M. (2009). An empirical examination of the best practices to ensure manufacturing flexibility: Lean alignment. *Journal of Manufacturing Technology Management*, *20*(3), 348–366. https://doi.org/10.1108/17410380910936792
85. Brännmark, M., & Holden, R. J. (2013). Packages of Participation: Swedish Employees' Experience of Lean Depends on How They Are Involved. *IIE Transactions on Occupational Ergonomics and Human Factors*, *1*(2), 93–108. https://doi.org/10.1080/21577323.2012.729001
86. Brauchli, R., Schaufeli, W. B., Jenny, G. J., Füllemann, D., & Bauer, G. F. (2013). Disentangling stability and change in job resources, job demands, and employee well-being—A three-wave study on the Job-Demands Resources model. *Journal of Vocational Behavior*, *83*(2), Article 2.
87. Brenner, M. D., Fairris, D., & Ruser, J. (2004). "Flexible" work practices and occupational safety and health: Exploring the relationship between cumulative trauma disorders and workplace transformation. *Industrial Relations: A Journal of Economy and Society*, *43*(1), 242–266.
88. Brito, M. F., Ramos, A. L., Carneiro, P., & Gonçalves, M. A. (2019). Ergonomic analysis in lean manufacturing and industry 4.0—A systematic review. *Lean Engineering for Global Development*, 95–127.

89. Brown, G. D., & O'rourke, D. (2007). Lean manufacturing comes to China: A case study of its impact on workplace health and safety. *International Journal of Occupational and Environmental Health*, *13*(3), 249–257.
90. Browne, M. W., & Cudeck, R. (1992). Alternative ways of assessing model fit. *Sociological Methods & Research*, *21*(2), 230–258.
91. Bruce, J., Scott, P., & Roberts, M. (2011). *Investigating employee resistance to Lean transformation: UK case study*. UK Academy for Information Systems, Oxford, United Kingdom.
92. Bruno, R., & Jordan, L. (2002). Lean Production and the Discourse of Dissent: Radicalizing the Shop Floor at Mitsubishi Motors? *WorkingUSA*, *6*(1), 108–134.
93. Buehlmann, U., & Fricke, C. F. (2016). Benefits of Lean transformation efforts in small- and medium-sized enterprises. *Production & Manufacturing Research*, *4*(1), 114–132. https://doi.org/10.1080/21693277.2016.1212679
94. Burawat, P. (2019). The relationships among transformational leadership, sustainable leadership, lean manufacturing and sustainability performance in Thai SMEs manufacturing industry. *International Journal of Quality & Reliability Management*, *36*(6), 1014–1036. https://doi.org/10.1108/IJQRM-09-2017-0178
95. Byrne, B. M. (2013). *Structural equation modeling with Mplus: Basic concepts, applications, and programming*. routledge.
96. Cadden, T., Millar, K., Treacy, R., & Humphreys, P. (2020). The mediating influence of organisational cultural practices in successful lean management implementation. *International Journal of Production Economics*, *229*, 107744. https://doi.org/10.1016/j.ijpe.2020.107744
97. Caldera, H. T. S., Desha, C., & Dawes, L. (2019). Evaluating the enablers and barriers for successful implementation of sustainable business practice in 'lean' SMEs. *Journal of Cleaner Production*, *218*, 575–590. https://doi.org/10.1016/j.jclepro.2019.01.239
98. Caloghirou, Y., Protogerou, A., Spanos, Y., & Papagiannakis, L. (2004). Industry-Versus Firm-specific Effects on Performance: *European Management Journal*, *22*(2), 231–243. https://doi.org/10.1016/j.emj.2004.01.017
99. Campagna, L., Pero, L., & Pero, M. (2020). Employees' Participation and Involvement in Lean Management: The Experience of a Training Program of Assembly Lines Workers. In M. Rossi, M. Rossini, & S. Terzi (Eds.), *Proceedings of the 6th European Lean Educator Conference* (Vol. 122, pp. 301–310). Springer International Publishing. https://doi.org/10.1007/978-3-030-41429-0_30
100. Camuffo, A., De Stefano, F., & Paolino, C. (2017). Safety Reloaded: Lean Operations and High Involvement Work Practices for Sustainable Workplaces. *Journal of Business Ethics*, *143*(2), 245–259. https://doi.org/10.1007/s10551-015-2590-8
101. Carlsson, I.-L., & Aronsson, H. (2017). Investing in lean to improve basic capabilities: A strategy for system supply? *Journal of Industrial Engineering and Management*, *10*(1), 28. https://doi.org/10.3926/jiem.2163
102. Carter, B., Danford, A., Howcroft, D., Richardson, H., Smith, A., & Taylor, P. (2013). 'Stressed out of my box': Employee experience of lean working and

occupational ill-health in clerical work in the UK public sector. *Work, Employment and Society*, *27*(5), 747–767. https://doi.org/10.1177/0950017012469064

103. Cartwright, S., & Cooper, C. L. (1997). *Managing workplace stress* (Vol. 1). Sage Publications.

104. Castillo, C. (2022). The workers' perspective: Emotional consequences during a lean manufacturing change based on VSM analysis. *Journal of Manufacturing Technology Management*, *33*(9), 19–39. https://doi.org/10.1108/JMTM-06-2021-0212

105. Chan, S. W., Ismail, F., Ahmad, M. F., Zaman, I., & Lim, H. Q. (2019). *Factors and Barriers Influencing Lean Production System Adoption in Manufacturing Industries* (2). *8*(2), Article 2.

106. Chaplin, L., Heap, J., & O'Rourke, S. T. J. (2016). Could "Lean Lite" be the cost effective solution to applying lean manufacturing in developing economies? *International Journal of Productivity and Performance Management*, *65*(1), 126–136. https://doi.org/10.1108/IJPPM-02-2015-0034

107. Chaudhary, A., Singh, A. K., & Meena, M. L. (2020). Productivity improvement of an electrical appliance industry by implementing lean manufacturing tools and a low-cost intervention (a case study). *International Journal of Productivity and Quality Management*, *31*(3), 390–411. https://doi.org/10.1504/ijpqm.2020.110942

108. Che Mamat, R., Md Deros, B., Rahman, M. N. Ab., & Ahmad Jamil, N. (2014). Employees' Perception on Lean Production System Implementation: A Case of Malaysia Automotive Component Manufacturer. *Applied Mechanics and Materials*, *660*, 1032–1037. https://doi.org/10.4028/www.scientific.net/AMM.660.1032

109. Chen, L., & Meng, B. (2010). Why most Chinese enterprises fail in deploying lean production. *Asian Social Science*, *6*(3), 52.

110. Choi, T. Y., Rungtusanatham, M., & Kim, J. (1997). Continuos improvement on the shop floor: Lessons from small to midsize firms. *Business Horizons*, *40*(6), Article 6.

111. Chowdary, B. V., & George, D. (2011). Application of flexible lean tools for restructuring of manufacturing operations: A case study. *Global Journal of Flexible Systems Management*, *12*(1–2), 1–8. https://doi.org/10.1007/BF03396595

112. Christian, M. S., Garza, A. S., & Slaughter, J. E. (2011). Work engagement: A quantitative review and test of its relations with task and contextual performance. *Personnel Psychology*, *64*(1), 89–136.

113. Ciszewski, M., & Wyrwicka, M. K. (2020). Shopfloor management (SFM) as a tool for improving control of production and visualization of results. *Logforum*, *16*(2), 299–310. Scopus. https://doi.org/10.17270/J.LOG.2020.385

114. Coetzer, A., Kock, H., & Wallo, A. (2017). Distinctive Characteristics of Small Businesses as Sites for Informal Learning. *Human Resource Development Review*, *16*(2), 111–134. https://doi.org/10.1177/1534484317704291

115. Conti, R., Angelis, J., Cooper, C., Faragher, B., & Gill, C. (2006). The effects of lean production on worker job stress. *International Journal of Operations & Production Management*, *26*(9), 1013–1038. https://doi.org/10.1108/01443570610682616

116. Conti, R., & Gill, C. (1998). Hypothesis creation and modelling in job stress studies: The effect of just-in-time and lean production. *International Journal of Employment Studies*, *6*(1), 149–173.
117. Cooper, D. R., Schindler, P. S., & Sun, J. (2006). *Business research methods* (Vol. 9). Mcgraw-hill New York.
118. Cooper, H. (2015). *Research synthesis and meta-analysis: A step-by-step approach* (Vol. 2). Sage publications.
119. Corbeanu, A., & Iliescu, D. (2023). The Link Between Work Engagement and Job Performance: A Meta-Analysis. *Journal of Personnel Psychology*, *22*(3), 111–122. https://doi.org/10.1027/1866-5888/a000316
120. Corrêa, H. L., Ellram, L. M., Scavarda, A. J., & Cooper, M. C. (2007). An operations management view of the services and goods offering mix. *International Journal of Operations & Production Management*.
121. Costa, F., Lispi, L., Staudacher, A. P., Rossini, M., Kundu, K., & Cifone, F. D. (2019). How to foster Sustainable Continuous Improvement: A cause-effect relations map of Lean soft practices. *Operations Research Perspectives*, *6*, 100091. https://doi.org/10.1016/j.orp.2018.100091
122. Cox, A., & Chicksand, D. (2005). The Limits of Lean Management Thinking: *European Management Journal*, *23*(6), 648–662. https://doi.org/10.1016/j.emj.2005.10.010
123. Crawford, E. R., LePine, J. A., & Rich, B. L. (2010). Linking job demands and resources to employee engagement and burnout: A theoretical extension and meta-analytic test. *Journal of Applied Psychology*, *95*(5), 834–848. https://doi.org/10.1037/a0019364
124. Creswell, J. W. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.
125. Cronin, C. (2011). Doing your literature review: Traditional and systematic techniques. *Evaluation & Research in Education*, *24*(3), 219–221. https://doi.org/10.1080/09500790.2011.581509
126. Cropanzano, R., Rupp, D. E., & Byrne, Z. S. (2003). The relationship of emotional exhaustion to work attitudes, job performance, and organizational citizenship behaviors. *Journal of Applied Psychology*, *88*(1), 160–169. https://doi.org/10.1037/0021-9010.88.1.160
127. Cuatrecasas, L. (2004). A lean management implementation method in service operations. *International Journal of Services, Technology and Management*, *5*(5–6), 532–544. https://doi.org/10.1504/IJSTM.2004.006283
128. Cullinane, S.-J., Bosak, J., Flood, P. C., & Demerouti, E. (2013). Job design under lean manufacturing and its impact on employee outcomes. *Organizational Psychology Review*, *3*(1), Article 1. https://doi.org/10.1177/2041386612456412
129. Cullinane, S.-J., Bosak, J., Flood, P. C., & Demerouti, E. (2014). Job design under lean manufacturing and the quality of working life: A job demands and resources

perspective. *The International Journal of Human Resource Management*, *25*(21), Article 21. https://doi.org/10.1080/09585192.2014.948899

130. Cullinane, S.-J., Bosak, J., Flood, P. C., & Demerouti, E. (2017). Job crafting for lean engagement: The interplay of day and job-level characteristics. *European Journal of Work and Organizational Psychology*, *26*(4), 541–554. https://doi.org/10.1080/1359432X.2017.1320280
131. Curran, J., & Blackburn, R. A. (2001). The need for small business research. *Researching the Small Enterprise. London: Sage Publications*.
132. Dahlgaard, J. J., & Dahlgaard-Park, S. M. (2006). Lean production, six sigma quality, TQM and company culture. *The TQM Magazine*.
133. Danese, P., Manfe, V., & Romano, P. (2018). A Systematic Literature Review on Recent Lean Research: State-of-the-art and Future Directions. *INTERNATIONAL JOURNAL OF MANAGEMENT REVIEWS*, *20*(2), 579–605. https://doi.org/10.1111/ijmr.12156
134. Darcy, C., Hill, J., McCabe, T., & McGovern, P. (2014). A consideration of organisational sustainability in the SME context: A resource-based view and composite model. *European Journal of Training and Development*, *38*(5), 398–414.
135. De Braine, R., & Roodt, G. (2011). The Job Demands-Resources model as predictor of work identity and work engagement: A comparative analysis. *SA Journal of Industrial Psychology*, *37*(2), 11 pages. https://doi.org/10.4102/sajip.v37i2.889
136. de Haan, J., Naus, F., & Overboom, M. (2012). Creative tension in a lean work environment: Implications for logistics firms and workers. *International Journal of Production Economics*, *137*(1), 157–164. https://doi.org/10.1016/j.ijpe.2011.11.005
137. De Jonge, J., & Dormann, C. (2006). Stressors, resources, and strain at work: A longitudinal test of the triple-match principle. *Journal of Applied Psychology*, *91*(6), 1359.
138. de Treville, S., & Antonakis, J. (2006). Could lean production job design be intrinsically motivating? Contextual, configurational, and levels-of-analysis issues. *Journal of Operations Management*, *24*(2), 99–123. https://doi.org/10.1016/j.jom.2005.04.001
139. Delbridge, R. (2005). Workers under lean manufacturing. *The Essentials of the New Workplace: A Guide to the Human Impact of Modern Working Practices*, 15–32.
140. Delbridge, R., Lowe, J., & Oliver, N. (2000). Shopfloor responsibilities under lean teamworking. *Human Relations*, *53*(11), 1459–1479.
141. Delbridge, R., Turnbull, P., & Wilkinson, B. (1992). Pushing back the frontiers: Management control and work intensification under JIT/TQM factory regimes. *New Technology, Work and Employment*, *7*(2), 97–106.
142. Demerouti, E., & Bakker, A. B. (2011). The job demands-resources model: Challenges for future research. *SA Journal of Industrial Psychology*, *37*(2), 01–09.
143. Demerouti, E., Bakker, A. B., Nachreiner, F., & Schaufeli, W. B. (2001). The job demands-resources model of burnout. *Journal of Applied Psychology*, *86*(3), 499–512. https://doi.org/10.1037/0021-9010.86.3.499

144. Demerouti, E., Cropanzano, R., Bakker, A., & Leiter, M. (2010). From thought to action: Employee work engagement and job performance. *Work Engagement: A Handbook of Essential Theory and Research*, *65*(1), 147–163.
145. Deming, W. E. (2018). *Out of the Crisis, reissue*. MIT press.
146. Dijkhuizen, J., Gorgievski, M., van Veldhoven, M., & Schalk, R. (2016). Feeling successful as an entrepreneur: A job demands — resources approach. *International Entrepreneurship and Management Journal*, *12*(2), 555–573. https://doi.org/10.1007/s11365-014-0354-z
147. Dombrowski, U., Crespo, I., & Zahn, T. (2010). Adaptive Configuration of a Lean Production System in Small and Medium-sized Enterprises. *Production Engineering*, *4*(4), 341–348. https://doi.org/10.1007/s11740-010-0250-5
148. Dombrowski, U., & Mielke, T. (2014). Lean Leadership – 15 Rules for a Sustainable Lean Implementation. *Procedia CIRP*, *17*, 565–570. https://doi.org/10.1016/j.procir.2014.01.146
149. Dombrowski, U., Mielke, T., & Schulze, S. (2012). Employee Participation in the Implementation of Lean Production Systems. In H. A. ElMaraghy (Ed.), *Enabling Manufacturing Competitiveness and Economic Sustainability* (pp. 428–433). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-23860-4_70
150. Done, A., Voss, C., & Rytter, N. G. (2011). Best practice interventions: Short-term impact and long-term outcomes. *Journal of Operations Management*, *29*(5), 500–513.
151. Dora, M., Kumar, M., & Gellynck, X. (2016). Determinants and barriers to lean implementation in food-processing SMEs – a multiple case analysis. *Production Planning & Control*, *27*(1), 1–23. https://doi.org/10.1080/09537287.2015.1050477
152. Dora, M., Van Goubergen, D., Kumar, M., Molnar, A., & Gellynck, X. (2014). Application of lean practices in small and medium-sized food enterprises. *British Food Journal*, *116*(1), 125–141. https://doi.org/10.1108/BFJ-05-2012-0107
153. Dow, D., Samson, D., & Ford, S. (1999). Exploding the myth: Do all quality management practices contribute to superior quality performance? *Production and Operations Management*, *8*(1), 1–27.
154. Dowlatshahi, S., & Taham, F. (2009). The development of a conceptual framework for Just-In-Time implementation in SMEs. *Production Planning and Control*, *20*(7), 611–621.
155. Eekhout, I., Enders, C. K., Twisk, J. W. R., De Boer, M. R., De Vet, H. C. W., & Heymans, M. W. (2015). Analyzing Incomplete Item Scores in Longitudinal Data by Including Item Score Information as Auxiliary Variables. *Structural Equation Modeling: A Multidisciplinary Journal*, *22*(4), 588–602. https://doi.org/10.1080/10705511.2014.937670
156. Eklöf, M., Pousette, A., Dellve, L., Skagert, K., & Ahlborg, G. (2010). Gothenburg manager stress inventory (GMSI). *Utveckling Av Ett Variations-Och Förändringskänsligt Frågeinstrument För Mätning Av Stressorexponering, Copingbeteende Och Copingresurser Bland*, *1*.

157. Engen, M., & Magnusson, P. (2015). Exploring the role of front-line employees as innovators. *The Service Industries Journal*, *35*(6), 303–324.
158. Erdil, N. O., Aktas, C. B., & Arani, O. M. (2018). Embedding sustainability in lean six sigma efforts. *Journal of Cleaner Production*, *198*, 520–529. https://doi.org/10.1016/j.jclepro.2018.07.048
159. Esser, I., & Olsen, K. M. (2012). Perceived job quality: Autonomy and job security within a multi-level framework. *European Sociological Review*, *28*(4), 443–454.
160. Eswaramoorthi, M., Kathiresan, G. R., Prasad, P. S. S., & Mohanram, P. V. (2011). A survey on lean practices in Indian machine tool industries. *The International Journal of Advanced Manufacturing Technology*, *52*(9–12), 1091–1101. https://doi.org/10.1007/s00170-010-2788-y
161. European Commission. (2021). *SME definition*. https://ec.europa.eu/growth/smes/sme-definition_en
162. Eze, U. C., Goh, G. G. G., Goh, C. Y., & Tan, T. L. (2013). Perspectives of SMEs on knowledge sharing. *Vine*, *43*(2), 210–236. https://doi.org/10.1108/03055721311329963
163. Fadly Habidin, N., & Mohd Yusof, S. (2013). Critical success factors of Lean Six Sigma for the Malaysian automotive industry. *International Journal of Lean Six Sigma*, *4*(1), 60–82. https://doi.org/10.1108/20401461311310526
164. Fernandes, F., Sousa, S., & Lopes, I. da S. (2013). *On the use of quality tools: A case study*.
165. Field, A. P. (2009). *Discovering statistics using SPSS: And sex, drugs and rock "n" roll* (3rd ed). SAGE Publications.
166. Flynn, B. B., Schroeder, R. G., & Sakakibara, S. (1995). The impact of quality management practices on performance and competitive advantage. *Decision Sciences*, *26*(5), 659–691.
167. Forza, C. (1996). Work organization in lean production and traditional plants. *International Journal of Operations & Production Management*.
168. Found, P., Beale, J., Hines, P., Naim, M., Rich, N., Sarmiento, R., & Thomas, A. (2006). A theoretical framework for economic sustainability of manufacturing. *Cardiff University Innovative Manufacturing Research Centre, UK*.
169. Fu, S.-L., Chou, S.-Y., Chen, C.-K., & Wang, C.-W. (2015). Assessment and cultivation of total quality management organisational culture–an empirical investigation. *Total Quality Management & Business Excellence*, *26*(1–2), 123–139.
170. Gaiardelli, P., Resta, B., & Dotti, S. (2019). Exploring the role of human factors in lean management. *International Journal of Lean Six Sigma*, *10*(1), 339–366. https://doi.org/10.1108/IJLSS-08-2017-0094
171. Gambatese, J. A., Pestana, C., & Lee, H. W. (2017). Alignment between Lean Principles and Practices and Worker Safety Behavior. *Journal of Construction Engineering and Management*, *143*(1), 04016083. https://doi.org/10.1061/(ASCE)CO.1943-7862.0001209

172. Gandhi, N. S., Thanki, S. J., & Thakkar, J. J. (2018). Ranking of drivers for integrated lean-green manufacturing for Indian manufacturing SMEs. *Journal of Cleaner Production*, *171*, 675–689. https://doi.org/10.1016/j.jclepro.2017.10.041
173. Ganster, D. C., & Rosen, C. C. (2013). Work stress and employee health: A multidisciplinary review. *Journal of Management*, *39*(5), 1085–1122.
174. Gélinas, R., & Bigras, Y. (2004). The characteristics and features of SMEs: Favorable or unfavorable to logistics integration? *Journal of Small Business Management*, *42*(3), 263–278.
175. Genaidy, A. M., & Karwowski, W. (2003). Human performance in lean production environment: Critical assessment and research framework. *Human Factors and Ergonomics in Manufacturing & Service Industries*, *13*(4), 317–330.
176. George, M. L., Maxey, J., Rowlands, D. T., & Upton, M. (2004). *Lean six sigma pocket toolbook*. McGraw-Hill Professional Publishing.
177. Ghebregiorgis, F., & Karsten, L. (2007). Human resource management and performance in a developing country: The case of Eritrea. *The International Journal of Human Resource Management*, *18*(2), 321–332.
178. Ghlichlee, B., & Bayat, F. (2021). Frontline employees' engagement and business performance: The mediating role of customer-oriented behaviors. *Management Research Review*, *44*(2), 290–317.
179. Gilley, A., Gilley, J. W., & McMillan, H. S. (2009). Organizational change: Motivation, communication, and leadership effectiveness. *Performance Improvement Quarterly*, *21*(4), 75–94.
180. Glover, W. J., Farris, J. A., Van Aken, E. M., & Doolen, T. L. (2011). Critical success factors for the sustainability of Kaizen event human resource outcomes: An empirical study. *International Journal of Production Economics*, *132*(2), 197–213. https://doi.org/10.1016/j.ijpe.2011.04.005
181. Gnanaraj, S. M., Devadasan, S. R., Murugesh, R., & Sreenivasa, C. G. (2012). Sensitisation of SMEs towards the implementation of Lean Six Sigma – an initialisation in a cylinder frames manufacturing Indian SME. *Production Planning & Control*, *23*(8), Article 8. https://doi.org/10.1080/09537287.2011.572091
182. Gnanavel, S. S., Balasubramanian, V., & Narendran, T. T. (2015). Suzhal – An Alternative Layout to Improve Productivity and Worker Well-being in Labor Demanded Lean Environment. *Procedia Manufacturing*, *3*, 574–580. https://doi.org/10.1016/j.promfg.2015.07.268
183. Godard, J. (2004). A critical assessment of the high-performance paradigm. *British Journal of Industrial Relations*, *42*(2), Article 2.
184. Godinho Filho, M., Ganga, G. M. D., & Gunasekaran, A. (2016). Lean manufacturing in Brazilian small and medium enterprises: Implementation and effect on performance. *International Journal of Production Research*, *54*(24), 7523–7545. https://doi.org/10.1080/00207543.2016.1201606

185. Gonzalez, M. E., Quesada, G., Mora-Monge, C. A., & Barton, M. E. (2019). An empirical study of the application of lean tools in U.S. industry. *Quality Management Journal*, *26*(4), 174–190. https://doi.org/10.1080/10686967.2019.1647769
186. Goodyer, J., Murti, Y., Grigg, N., & Shekar, A. (2011). *Lean: Insights into SMEs ability to sustain improvement*. 1–10.
187. Grandzol, J. R., & Gershon, M. (1997). Which TQM practices really matter: An empirical investigation. *Quality Management Journal*, *4*(4), 43–59.
188. Grewal, C. (2008). An initiative to implement lean manufacturing using value stream mapping in a small company. *International Journal of Manufacturing Technology and Management*, *15*(3–4), 404–417.
189. Grigg, N. P., Goodyer, J. E., & Frater, T. G. (2020). Sustaining lean in SMEs: Key findings from a 10-year study involving New Zealand manufacturers. *Total Quality Management & Business Excellence*, *31*(5–6), 609–622. https://doi.org/10.1080/14783363.2018.1436964
190. Guenzi, P., & Nijssen, E. J. (2021). The impact of digital transformation on salespeople: An empirical investigation using the JD-R model. *Journal of Personal Selling & Sales Management*, *41*(2), 130–149. https://doi.org/10.1080/08853134.2021.1918005
191. Gunasekaran, A., & Lyu, J. (1997). Implementation of just-in-time in a small company: A case study. *Production Planning & Control*, *8*(4), 406–412.
192. Gupta, S., & Jain, S. K. (2013). A literature review of lean manufacturing. *International Journal of Management Science and Engineering Management*, *8*(4), 241–249. https://doi.org/10.1080/17509653.2013.825074
193. Hackman, J. R. (1980). Work redesign and motivation. *Professional Psychology*, *11*(3), 445.
194. Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate data analysis* (Eighth edition). Cengage.
195. Hakanen, J. J., Schaufeli, W. B., & Ahola, K. (2008). The Job Demands-Resources model: A three-year cross-lagged study of burnout, depression, commitment, and work engagement. *Work & Stress*, *22*(3), 224–241.
196. Halbesleben, J. R., & Bowler, W. (2007). Emotional exhaustion and job performance: The mediating role of motivation. *Journal of Applied Psychology*, *92*(1), Article 1.
197. Halbesleben, J. R., & Buckley, M. R. (2004). Burnout in organizational life. *Journal of Management*, *30*(6), 859–879.
198. Halbesleben, J. R., & Demerouti, E. (2005). The construct validity of an alternative measure of burnout: Investigating the English translation of the Oldenburg Burnout Inventory. *Work & Stress*, *19*(3), 208–220.
199. Hallstedt, S. I., Thompson, A. W., & Lindahl, P. (2013). Key elements for implementing a strategic sustainability perspective in the product innovation process. *Journal of Cleaner Production*, *51*, 277–288.

200. Handel, M. J. (2014). Theories of lean management: An empirical evaluation. *Social Science Research*, *44*, 86–102. https://doi.org/10.1016/j.ssresearch.2013.10.009
201. Harris, G., Stone, K. B., Mayeshiba, T., Componation, P. J., & Farrington, P. A. (2014). Transitioning from teaching lean tools to teaching lean transformation. *Journal of Enterprise Transformation*, *4*(3), 191–204.
202. Harris, T. C., & Locke, E. A. (1974). Replication of white-collar-blue-collar differences in sources of satisfaction and dissatisfaction. *Journal of Applied Psychology*, *59*(3), 369.
203. Hasle, P. (2009). Lean and the psychosocial work environment. *Prerequisites for Healthy Organisational Changes*, 1–9.
204. Hasle, P. (2014). Lean Production-An Evaluation of the Possibilities for an Employee Supportive Lean Practice: An Employee Supportive Lean Practice. *Human Factors and Ergonomics in Manufacturing & Service Industries*, *24*(1), 40–53. https://doi.org/10.1002/hfm.20350
205. Hasle, P., Bojesen, A., Langaa Jensen, P., & Bramming, P. (2012). Lean and the working environment: A review of the literature. *International Journal of Operations & Production Management*, *32*(7), 829–849. https://doi.org/10.1108/01443571211250103
206. Hernandez-Matias, J. C., Ocampo, J. R., Hidalgo, A., & Vizan, A. (2019). Lean manufacturing and operational performance: Interrelationships between human-related lean practices. *Journal of Manufacturing Technology Management*, *31*(2), 217–235. https://doi.org/10.1108/JMTM-04-2019-0140
207. Hesse-Biber, S. N., & Leavy, P. (2010). *The practice of qualitative research*. Sage.
208. Hilton, R. J., & Sohal, A. (2012). A conceptual model for the successful deployment of Lean Six Sigma. *International Journal of Quality & Reliability Management*, *29*(1), 54–70. https://doi.org/10.1108/02656711211190873
209. Hiltrop, J. M. (1992). Just-in-time manufacturing: Implications for the management of human resources. *European Management Journal*, *10*(1), 49–55.
210. Hines, P., Butterworth, C., Greenlee, C., Jekiel, C., & Taylor, D. (2022). Turning the lean world upside down. *International Journal of Lean Six Sigma*, *13*(5), Article 5. https://doi.org/10.1108/IJLSS-09-2021-0166
211. Hines, P., Found, P., Griffiths, G., & Harrison, R. (2011). *Staying Lean: Thriving, Not Just Surviving* (Vol. 2). CRC Press.
212. Hines, P., Holweg, M., & Rich, N. (2004). Learning to evolve: A review of contemporary lean thinking. *International Journal of Operations & Production Management*, *24*(10), 994–1011. https://doi.org/10.1108/01443570410558049
213. Ho, D. C., Duffy, V. G., & Shih, H. M. (1999). An empirical analysis of effective TQM implementation in the Hong Kong electronics manufacturing industry. *Human Factors and Ergonomics in Manufacturing & Service Industries*, *9*(1), 1–25.
214. Hobfoll, S. E. (2001). The influence of culture, community, and the nested-self in the stress process: Advancing conservation of resources theory. *Applied Psychology*, *50*(3), 337–421.

215. Hobfoll, S. E. (2002). Social and psychological resources and adaptation. *Review of General Psychology*, *6*(4), 307–324.
216. Hochwarter, W. A., Laird, M. D., & Brouer, R. L. (2008). Board up the windows: The interactive effects of hurricane-induced job stress and perceived resources on work outcomes. *Journal of Management*, *34*(2), 263–289.
217. Hofstede, G. (1980). Motivation, leadership, and organization: Do American theories apply abroad? *Organizational Dynamics*, *9*(1), 42–63.
218. Holweg, M. (2007). The genealogy of lean production. *Journal of Operations Management*, *25*(2), Article 2. https://doi.org/10.1016/j.jom.2006.04.001
219. Hopp, W. J. (2018). Positive lean: Merging the science of efficiency with the psychology of work. *International Journal of Production Research*, *56*(1–2), 398–413. https://doi.org/10.1080/00207543.2017.1387301
220. Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(1), 1–55.
221. Hu, Q., Mason, R., Williams, S. J., & Found, P. (2015). Lean implementation within SMEs: A literature review. *Journal of Manufacturing Technology Management*, *26*(7), 980–1012. https://doi.org/10.1108/JMTM-02-2014-0013
222. Huang, T.-P. (2011). Comparing motivating work characteristics, job satisfaction, and turnover intention of knowledge workers and blue-collar workers, and testing a structural model of the variables' relationships in China and Japan. *The International Journal of Human Resource Management*, *22*(4), 924–944. https://doi.org/10.1080/09585192.2011.555134
223. Huang, Z., Harris, G., & Loyd, N. (2021). An improved lean assessment based on employee perception. *Journal of Manufacturing Technology Management*, *32*(4), Article 4. https://doi.org/10.1108/JMTM-04-2020-0178
224. Huber, V. L., & Brown, K. A. (1991). Human resource issues in cellular manufacturing: A sociotechnical analysis. *Journal of Operations Management*, *10*(1), 138–159.
225. Hung, D., Martinez, M., Yakir, M., & Gray, C. (2015). Implementing a lean management system in primary care: Facilitators and barriers from the front lines. *Quality Management in Health Care*, *24*(3), 103–108.
226. Huo, M.-L., & Boxall, P. (2017). Lean production and the well-being of the frontline manager: The job demands – resources model as a diagnostic tool in Chinese manufacturing. *Asia Pacific Journal of Human Resources*, *55*(3), 280–297. https://doi.org/10.1111/1744-7941.12152
227. Huo, M.-L., & Boxall, P. (2018). Are all aspects of lean production bad for workers? An analysis of how problem-solving demands affect employee well-being. *Human Resource Management Journal*, *28*(4), 569–584. https://doi.org/10.1111/1748-8583.12204
228. Huo, M.-L., Boxall, P., & Cheung, G. W. (2019). Lean production, work intensification and employee wellbeing: Can line-manager support make a difference?

Economic and Industrial Democracy, 0143831X1989067. https://doi.org/10.1177/0143831X19890678

229. Inuwa, M., & Rahim, S. B. A. (2020). Lean readiness factors and organizational readiness for change in manufacturing SMEs: The role of organizational culture. *Journal of Critical Reviews*, *7*(5), 56–67. Scopus. https://doi.org/10.31838/jcr.07.05.10
230. Jackson, P. R., & Mullarkey, S. (2000). Lean production teams and health in garment manufacture. *Journal of Occupational Health Psychology*, *5*(2), Article 2. https://doi.org/10.1037/1076-8998.5.2.231
231. Jayamaha, N. P., Wagner, J. P., Grigg, N. P., Campbell-Allen, N. M., & Harvie, W. (2014). Testing a theoretical model underlying the 'Toyota Way'–an empirical study involving a large global sample of Toyota facilities. *International Journal of Production Research*, *52*(14), 4332–4350.
232. Jazayeri, M., & Hopper, T. (1999). Management accounting within world class manufacturing: A case study. *Management Accounting Research*, *10*(3), 263–301.
233. Jesson, J., Matheson, L., & Lacey, F. M. (2011). *Doing your literature review: Traditional and systematic techniques*. Sage Publications.
234. Jobin, M. V. (2015). Employee Involvement and Management Commitment in Lean Implementation. *Applied Mechanics and Materials*, *813–814*, 1150–1153. https://doi.org/10.4028/www.scientific.net/AMM.813-814.1150
235. Johnson, M. A., & Johnson, D. M. (2005). *Integrative total productive maintenance: Lean practices*. 16th Annual International Production and Operations Management Society (POMS) Conference, Chicago.
236. Jonassen, D. (2001). Can you train employees to solve problems? *Performance Improvement*, *40*(9), 18–24.
237. Jones, D. C., & Kato, T. (2012). Incidence, coverage and employee knowledge of participation in financial incentive schemes: Evidence from US cases. *The International Journal of Human Resource Management*, *23*(8), 1547–1569.
238. Jones, O., & Macpherson, A. (2006). Inter-organizational learning and strategic renewal in SMEs: Extending the 4I framework. *Long Range Planning*, *39*(2), 155–175.
239. Jones, R., Latham, J., & Betta, M. (2013). Creating the illusion of employee empowerment: Lean production in the international automobile industry. *The International Journal of Human Resource Management*, *24*(8), Article 8. https://doi.org/10.1080/09585192.2012.725081
240. Jorgensen, M., Davis, K., Kotowski, S., Aedla, P., & Dunning, K. (2005). Characteristics of job rotation in the Midwest US manufacturing sector. *Ergonomics*, *48*(15), 1721–1733.
241. Josefy, M., Kuban, S., Ireland, R. D., & Hitt, M. A. (2015). All things great and small: Organizational size, boundaries of the firm, and a changing environment. *Academy of Management Annals*, *9*(1), 715–802.
242. Judge, T. A., & Hurst, C. (2007). The benefits and possible costs of positive core self-evaluations: A review and agenda for future research. In *Positive Organizational Behavior* (pp. 159–174). Sage Publications.

243. Kahn, R. L., & Byosiere, P. (1992). *Stress in organizations.*
244. Kaiser, S., Patras, J., Adolfsen, F., Richardsen, A. M., & Martinussen, M. (2020). Using the Job Demands–Resources Model to Evaluate Work-Related Outcomes Among Norwegian Health Care Workers. *SAGE Open*, *10*(3), 215824402094743. https://doi.org/10.1177/2158244020947436
245. Kaminski, M. (2001). Unintended consequences: Organizational practices and their impact on workplace safety and productivity. *Journal of Occupational Health Psychology*, *6*(2), 127.
246. Karasek, R. A. (1979). Job Demands, Job Decision Latitude, and Mental Strain: Implications for Job Redesign. *Administrative Science Quarterly*, *24*(2), 285–308. https://doi.org/10.2307/2392498
247. Karatepe, O. M. (2011a). Customer aggression, emotional exhaustion, and hotel employee outcomes: A study in the United Arab Emirates. *Journal of Travel & Tourism Marketing*, *28*(3), 279–295.
248. Karatepe, O. M. (2011b). Do job resources moderate the effect of emotional dissonance on burnout?: A study in the city of Ankara, Turkey. *International Journal of Contemporary Hospitality Management*, *23*(1), 44–65. https://doi.org/10.1108/09596111111101661
249. Karatepe, O. M., & Aga, M. (2012). Work engagement as a mediator of the effects of personality traits on job outcomes: A study of frontline employees. *Services Marketing Quarterly*, *33*(4), 343–362.
250. Kattenbach, R., & Fietze, S. (2018). Entrepreneurial orientation and the job demands-resources model. *Personnel Review*, *47*(3), Article 3. https://doi.org/10.1108/PR-08-2016-0194
251. Kaynak, H. (2003). The relationship between total quality management practices and their effects on firm performance. *Journal of Operations Management*, *21*(4), 405–435.
252. Keijsers, G. J., Schaufeli, W. B., Le Blanc, P. M., Zwerts, C., & Miranda, D. R. (1995). Performance and burnout in intensive care units. *Work & Stress*, *9*(4), 513–527.
253. Khazanchi, S., Lewis, M. W., & Boyer, K. K. (2007). Innovation-supportive culture: The impact of organizational values on process innovation. *Journal of Operations Management*, *25*(4), 871–884.
254. Kim, D.-O., & Bae, J. (2005). Workplace innovation, employment relations and HRM: two electronics companies in South Korea. *The International Journal of Human Resource Management*, *16*(7), 1277–1302.
255. Kline, R. B. (2016). *Principles and practice of structural equation modeling*. Guilford Press.
256. Knol, W. H., Slomp, J., Schouteten, R. L. J., & Lauche, K. (2018). Implementing lean practices in manufacturing SMEs: Testing 'critical success factors' using Necessary Condition Analysis. *International Journal of Production Research*, *56*(11), Article 11. https://doi.org/10.1080/00207543.2017.1419583
257. Knol, W. H., Slomp, J., Schouteten, R. L. J., & Lauche, K. (2019). The relative importance of improvement routines for implementing lean practices. *International*

Journal of Operations & Production Management, *39*(2), 214–237. https://doi.org/10.1108/IJOPM-01-2018-0010

258. Kock, H., Gill, A., & Erik Ellström, P. (2008). Why do small enterprises participate in a programme for competence development? *Journal of Workplace Learning*, *20*(3), 181–194. https://doi.org/10.1108/13665620810860486
259. Koloszar, L. (2018). *Opportunities of lean thinking in improving the competitiveness of the Hungarian SME sector*. https://doi.org/10.24425/119523
260. Koo, C., Chung, N., & Ryoo, S. Y. (2014). How does ecological responsibility affect manufacturing firms' environmental and economic performance? *Total Quality Management & Business Excellence*, *25*(9–10), 1171–1189.
261. Korunka, C., Kubicek, B., Schaufeli, W. B., & Hoonakker, P. (2009). Work engagement and burnout: Testing the robustness of the Job Demands-Resources model. *The Journal of Positive Psychology*, *4*(3), 243–255. https://doi.org/10.1080/17439760902879976
262. Kosuge, R., Holm, M., Modig, N., & Ahlstrom, P. (2009). *Adoption of the lean concept at a Toyota car dealer: Identifying the key factors*. Proceedings of.
263. Kotey, B. (2005). Goals, management practices, and performance of family SMEs. *International Journal of Entrepreneurial Behavior & Research*.
264. Koukoulaki, T. (2014). The impact of lean production on musculoskeletal and psychosocial risks: An examination of sociotechnical trends over 20 years. *Applied Ergonomics*, *45*(2), 198–212. https://doi.org/10.1016/j.apergo.2013.07.018
265. Kramar, R. (2014). Beyond strategic human resource management: Is sustainable human resource management the next approach? *The International Journal of Human Resource Management*, *25*(8), 1069–1089.
266. Kubicek, B., Korunka, C., & Ulferts, H. (2013). Acceleration in the care of older adults: New demands as predictors of employee burnout and engagement. *Journal of Advanced Nursing*, *69*(7), 1525–1538.
267. Kull, T. J., Yan, T., Liu, Z., & Wacker, J. G. (2014). The moderation of lean manufacturing effectiveness by dimensions of national culture: Testing practice-culture congruence hypotheses. *International Journal of Production Economics*, *153*, 1–12. https://doi.org/10.1016/j.ijpe.2014.03.015
268. Kumar, M., & Antony, J. (2008). Comparing the quality management practices in UK SMEs. *Industrial Management & Data Systems*, *108*(9), 1153–1166. https://doi.org/10.1108/02635570810914865
269. Kumar, M., Antony, J., Singh, R. K., Tiwari, M. K., & Perry, D. (2006). Implementing the Lean Sigma framework in an Indian SME: A case study. *Production Planning & Control*, *17*(4), 407–423. https://doi.org/10.1080/09537280500483350
270. Kumar, M., Khurshid, K. K., & Waddell, D. (2014). Status of Quality Management practices in manufacturing SMEs: A comparative study between Australia and the UK. *International Journal of Production Research*, *52*(21), 6482–6495. https://doi.org/10.1080/00207543.2014.948574

271. Lacerda, A. P., Xambre, A. R., & Alvelos, H. M. (2016). Applying Value Stream Mapping to eliminate waste: A case study of an original equipment manufacturer for the automotive industry. *International Journal of Production Research*, *54*(6), Article 6.
272. Lai, Y., Saridakis, G., & Blackburn, R. (2015). Job Stress in the United Kingdom: Are Small and Medium-Sized Enterprises and Large Enterprises Different?: Job Stress in the United Kingdom. *Stress and Health*, *31*(3), 222–235. https://doi.org/10.1002/smi.2549
273. Lande, M., Shrivastava, R. L., & Seth, D. (2016). Critical success factors for Lean Six Sigma in SMEs (small and medium enterprises). *The TQM Journal*, *28*(4), 613–635. https://doi.org/10.1108/TQM-12-2014-0107
274. Landsbergis, P. A., Adler, P. S., Babson, S., Johnson, J., Kaminski, M., Lessin, N., MacDuffie, J. P., Nishiyama, K., Parker, S., & Richardson, C. (1999). Lean Production and Worker Health: A Discussion. *NEW SOLUTIONS: A Journal of Environmental and Occupational Health Policy*, *8*(4), Article 4. https://doi.org/10.2190/8DFT-3N8B-8TCF-M3U1
275. Landsbergis, P. A., Cahill, J., & Schnall, P. (1999). The impact of lean production and related new systems of work organization on worker health. *Journal of Occupational Health Psychology*, *4*(2), 108.
276. Lauver, K. J., Nahm, A. Y., Opall, B. S., & Keyes, J. P. (2018). Becoming lean: The employee perspective. *Journal of Business Strategy*, *39*(6), 43–49. https://doi.org/10.1108/JBS-04-2017-0041
277. Lazaro, C., Shinn, M., & Robinson, P. E. (1984). Burnout, job performance, and job withdrawal behaviors. *Journal of Health and Human Resources Administration*, 213–234.
278. Lee, C. Y. (2004). TQM in small manufacturers: An exploratory study in China. *International Journal of Quality & Reliability Management*, *21*(2), 175–197. https://doi.org/10.1108/02656710410516970
279. Leedy, P. D., & Ormrod, J. E. (2015). Practical research: Planning and design, global edition. *England: Pearson Education Limited*.
280. LePine, J. A., Podsakoff, N. P., & LePine, M. A. (2005). A meta-analytic test of the challenge stressor–hindrance stressor framework: An explanation for inconsistent relationships among stressors and performance. *Academy of Management Journal*, *48*(5), 764–775.
281. Lesener, T., Gusy, B., & Wolter, C. (2019). The job demands-resources model: A meta-analytic review of longitudinal studies. *Work & Stress*, *33*(1), Article 1. https://doi.org/10.1080/02678373.2018.1529065
282. Lewchuk, W., & Robertson, D. (1996). Working Conditions under Lean Production: A Worker-based Benchmarking Study. *Asia Pacific Business Review*, *2*(4), 60–81. https://doi.org/10.1080/13602389600000020
283. Lewchuk, W., Stewart, P., & Yates, C. (2001). Quality of working life in the automobile industry: A Canada-UK comparative study. *New Technology, Work and Employment*, *16*(2), 72–87.

284. Lewig, K. A., Xanthopoulou, D., Bakker, A. B., Dollard, M. F., & Metzer, J. C. (2007). Burnout and connectedness among Australian volunteers: A test of the Job Demands–Resources model. *Journal of Vocational Behavior*, *71*(3), 429–445.
285. Leyer, M., Reus, M., & Moormann, J. (2021). How satisfied are employees with lean environments? *Production Planning & Control*, *32*(1), 52–62.
286. Li, B., Nahm, A. Y., Wyland, R., Ke, J.-Y., & Yan, W. (2015). Reassessing the role of Chinese workers in problem solving: A study of transformational leadership, trust and security in 'lean' manufacturing. *Asia Pacific Business Review*, *21*(4), 464–481. https://doi.org/10.1080/13602381.2014.950056
287. Liker, J. (2004). *The toyota way*. Esensi.
288. Liker, J., & Meier, D. (2007). *Developing Your People the Toyota Way*. McGraw Hill.
289. Liker, J., & Wu, Y. (2000). US suppliers and supply chain superiority. *Sloan Management Review*, *42*(1), 81–93.
290. Lindskog, P., Hemphälä, J., Eklund, J., & Eriksson, A. (2016). Lean in healthcare: Engagement in development, job satisfaction or exhaustion? *Journal of Hospital Administration*, *5*(5), 91. https://doi.org/10.5430/jha.v5n5p91
291. Lindskog, P., Hemphälä, J., & Eriksson, A. (2017). Lean tools promoting individual innovation in healthcare. *Creativity and Innovation Management*, *26*(2), 175–188. https://doi.org/10.1111/caim.12201
292. Lodgaard, E., Ingvaldsen, J. A., Gamme, I., & Aschehoug, S. (2016). Barriers to Lean Implementation: Perceptions of Top Managers, Middle Managers and Workers. *Procedia CIRP*, *57*, 595–600. https://doi.org/10.1016/j.procir.2016.11.103
293. Longoni, A., Pagell, M., Johnston, D., & Veltri, A. (2013). When does lean hurt? – An exploration of lean practices and worker health and safety outcomes. *International Journal of Production Research*, *51*(11), 3300–3320. https://doi.org/10.1080/00207543.2013.765072
294. Lopez-Martin, E., & Topa, G. (2019). Organizational Culture and Job Demands and Resources: Their Impact on Employees' Wellbeing in a Multivariate Multilevel Model. *International Journal of Environmental Research and Public Health*, *16*(17), 3006. https://doi.org/10.3390/ijerph16173006
295. Losonci, D., Demeter, K., & Jenei, I. (2011). Factors influencing employee perceptions in lean transformations. *International Journal of Production Economics*, *131*(1), 30–43. https://doi.org/10.1016/j.ijpe.2010.12.022
296. 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*, *37*(2), 205–225. https://doi.org/10.1108/IJOPM-11-2014-0524
297. Loyd, N., Harris, G., Gholston, S., & Berkowitz, D. (2020). Development of a lean assessment tool and measuring the effect of culture from employee perception. *Journal of Manufacturing Technology Management*, *31*(7), 1439–1456. https://doi.org/10.1108/JMTM-10-2019-0375

298. Maalouf, M., & Gammelgaard, B. (2016). Managing paradoxical tensions during the implementation of lean capabilities for improvement. *International Journal of Operations & Production Management*.
299. Maarof, M. G., & Mahmud, F. (2016). A Review of Contributing Factors and Challenges in Implementing Kaizen in Small and Medium Enterprises. *Procedia Economics and Finance*, *35*, 522–531. https://doi.org/10.1016/S2212-5671(16)00065-4
300. MacCallum, R. C., Browne, M. W., & Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods*, *1*(2), 130.
301. MacDuffie, J. P. (1995). Human resource bundles and manufacturing performance: Organizational logic and flexible production systems in the world auto industry. *Ilr Review*, *48*(2), 197–221.
302. Magnani, F., Carbone, V., & Moatti, V. (2019). The human dimension of lean: A literature review. *Supply Chain Forum: An International Journal*, *20*(2), 132–144. https://doi.org/10.1080/16258312.2019.1570653
303. Majava, J., & Ojanperä, T. (2017). Lean Production Development in SMEs: A Case Study. *Management and Production Engineering Review*, *8*(2), 41–48. https://doi.org/10.1515/mper-2017-0016
304. 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
305. Malmbrandt, M., & Åhlström, P. (2013). An instrument for assessing lean service adoption. *International Journal of Operations & Production Management*.
306. Mamat, R. C., Md Deros, B., Ab Rahman, M. N., Omar, M. K., & Abdullah, S. (2015). Soft lean practices for successful lean production system implementation in Malaysia automotive SMEs: A proposed framework. *Jurnal Teknologi*, *77*(27), 141–150. Scopus. https://doi.org/10.11113/jt.v77.6910
307. Marin-Garcia, J. A., & Bonavia, T. (2015). Relationship between employee involvement and lean manufacturing and its effect on performance in a rigid continuous process industry. *International Journal of Production Research*, *53*(11), 3260–3275. https://doi.org/10.1080/00207543.2014.975852
308. Martinez, F., & Janečka, J. (2017). Building Lean Bodies With Lean Management: Implementation of Lean Principles in Entrepreneurship. *Innovation Management, Entrepreneurship and Sustainability (IMES 2017)*, *1*(1), 349–359.
309. Marvel, J. H., & Standridge, C. R. (2009). Simulation-enhanced lean design process. *Journal of Industrial Engineering and Management*, *2*(1), 90–113.
310. Maslach, C. (2003). *Burnout: The cost of caring*. Ishk.
311. Mathur, A., Mittal, M., & Dangayach, G. S. (2012). Improving productivity in Indian SMEs. *Production Planning & Control*, *23*(10–11), 754–768.

312. Matsunaga, M. (2008). Item Parceling in Structural Equation Modeling: A Primer. *Communication Methods and Measures*, *2*(4), 260–293. https://doi.org/10.1080/19312450802458935
313. Matt, D. T., & Rauch, E. (2013). Implementation of Lean Production in Small Sized Enterprises. *Procedia CIRP*, *12*, 420–425. https://doi.org/10.1016/j.procir.2013.09.072
314. Mazanai, M. (2012). Impact of just-in-time (JIT) inventory system on efficiency, quality and flexibility among manufacturing sector, small and medium enterprise (SMEs) in South Africa. *African Journal of Business Management*, *6*(17), 5786–5791.
315. Mazzocato, P., Savage, C., Brommels, M., Aronsson, H., & Thor, J. (2010). Lean thinking in healthcare: A realist review of the literature. *BMJ Quality & Safety*, *19*(5), 376–382.
316. McLain, D. L., & Jarrell, K. A. (2007). The perceived compatibility of safety and production expectations in hazardous occupations. *Journal of Safety Research*, *38*(3), 299–309.
317. McLellan, R. K. (2017). Work, Health, And Worker Well-Being: Roles And Opportunities For Employers. *Health Affairs*, *36*(2), 206–213. https://doi.org/10.1377/hlthaff.2016.1150
318. McMackin, J., & Flood, P. (2019). A theoretical framework for the social pillar of lean. *Journal of Organizational Effectiveness: People and Performance*, *6*(1), 39–55. https://doi.org/10.1108/JOEPP-06-2018-0039
319. Mehri, D. (2006). The Darker Side of Lean: An Insider's Perspective on the Realities of the Toyota Production System. *Academy of Management Perspectives*, *20*(2), 21–42. https://doi.org/10.5465/amp.2006.20591003
320. Mehta, V., & Shah, H. (2005). Characteristics of a Work Organization from a Lean Perspective. *Engineering Management Journal*, *17*(2), 14–20. https://doi.org/10.1080/10429247.2005.11415282
321. Meijman, T. F., & Mulder, G. (2013). Psychological aspects of workload. In *A handbook of work and organizational psychology* (pp. 15–44). Psychology Press.
322. Melton, T. (2005). The benefits of lean manufacturing: What lean thinking has to offer the process industries. *Chemical Engineering Research and Design*, *83*(6), 662–673.
323. Merriam, S. B., & Tisdell, E. J. (2015). *Qualitative research: A guide to design and implementation*. John Wiley & Sons.
324. Miles, M. B., & Huberman, A. M. (1994). *Qualitative Data Analysis: An Expanded Sourcebook*. SAGE Publications. https://books.google.si/books?id=U4lU_-wJ5QEC
325. Minh, K. S., Zailani, S., Iranmanesh, M., & Heidari, S. (2019). Do lean manufacturing practices have negative impact on job satisfaction? *International Journal of Lean Six Sigma*, *10*(1), 257–274. https://doi.org/10.1108/IJLSS-11-2016-0072
326. Minh, N. D., Dat, L. Q., Son, N. H., Tuan, P. M., & Toan, N. D. (2017). Application of visual management in small medium enterprises in Vietnam. *International Journal of Entrepreneurship and Innovation Management*, *21*(6), Article 6.

327. “Miracle” Qi, J., Ellinger, A. E., & Franke, G. R. (2018). Work design and frontline employee engagement. *Journal of Service Theory and Practice*, *28*(5), 636–660.
328. Mirdad, W. K., & Eseonu, C. I. (2015). A Conceptual Map of the Lean Nomenclature: Comparing Expert Classification to the Lean Literature. *Engineering Management Journal*, *27*(4), 188–202. https://doi.org/10.1080/10429247.2015.1082068
329. Moayed, F. A., & Shell, R. L. (2009). Comparison and evaluation of maintenance operations in lean versus non-lean production systems. *Journal of Quality in Maintenance Engineering*, *15*(3), 285–296. https://doi.org/10.1108/13552510910983224
330. Moeuf, A., Tamayo, S., Lamouri, S., Pellerin, R., & Lelievre, A. (2016). Strengths and weaknesses of small and medium sized enterprises regarding the implementation of lean manufacturing. *IFAC-PapersOnLine*, *49*(12), 71–76. https://doi.org/10.1016/j.ifacol.2016.07.552
331. Mohammad, I. S., & Oduoza, C. F. (2019). Interactions of Lean enablers in Manufacturing SMEs using Interpretive Structural Modelling Approach—A case study of KRI. *29th International Conference on Flexible Automation and Intelligent Manufacturing (FAIM 2019), June 24-28, 2019, Limerick, Ireland, Beyond Industry 4.0: Industrial Advances, Engineering Education and Intelligent Manufacturing*, *38*, 900–907. https://doi.org/10.1016/j.promfg.2020.01.172
332. Mohd Zahari, F., Nordin, N., Mohd Asaad, M. N., & Mohamed, R. (2019). Knowledge transfer in Lean management: Experience from Malaysian SME. *Journal of Technology and Operations Management*, *2*, 53-61%V 14. https://doi.org/10.32890/jtom2019.14.2.6
333. Mojtahedzadeh, N., Wirth, T., Nienhaus, A., Harth, V., & Mache, S. (2021). Job demands, resources and strains of outpatient caregivers during the COVID-19 pandemic in Germany: A qualitative study. *International Journal of Environmental Research and Public Health*, *18*(7), 3684. https://doi.org/10.3390/ijerph18073684
334. Molina, L. M., Lloréns Montes, F. J., & Del Mar Fuentes Fuentes, M. (2004). TQM and ISO 9000 effects on knowledge transferability and knowledge transfers. *Total Quality Management & Business Excellence*, *15*(7), 1001–1015.
335. Morgeson, F. P., & Humphrey, S. E. (2006). The Work Design Questionnaire (WDQ): Developing and validating a comprehensive measure for assessing job design and the nature of work. *Journal of Applied Psychology*, *91*(6), Article 6. https://doi.org/10.1037/0021-9010.91.6.1321
336. Mostafa, S., Dumrak, J., & Soltan, H. (2013). A framework for lean manufacturing implementation. *Production & Manufacturing Research*, *1*(1), 44–64. https://doi.org/10.1080/21693277.2013.862159
337. Mourtzis, D., Papathanasiou, P., & Fotia, S. (2016). Lean Rules Identification and Classification for Manufacturing Industry. *Procedia CIRP*, *50*, 198–203. https://doi.org/10.1016/j.procir.2016.04.097

338. Moyano-Fuentes, J., & Sacristán-Díaz, M. (2012). Learning on lean: A review of thinking and research. *International Journal of Operations & Production Management*.
339. Naidoo-Chetty, M., & du Plessis, M. (2021). Job Demands and Job Resources of Academics in Higher Education. *Frontiers in Psychology*, *12*, 631171. https://doi.org/10.3389/fpsyg.2021.631171
340. Nakajima, S. (1988). Introduction to TPM: total productive maintenance.(Translation). *Productivity Press, Inc., 1988,* 129.
341. Narula, R. (2004). R&D collaboration by SMEs: New opportunities and limitations in the face of globalisation. *Technovation*, *24*(2), 153–161.
342. Nawanir, G., Lim, K. T., Lee, K. L., Okfalisa, Moshood, T. D., & Ahmad, A. N. A. (2020). Less for more: The structural effects of lean manufacturing practices on sustainability of manufacturing SMEs in Malaysia. *International Journal of Supply Chain Management*, *9*(2), 961–975.
343. Neirotti, P. (2020). Work intensification and employee involvement in lean production: New light on a classic dilemma. *The International Journal of Human Resource Management*, *31*(15), 1958–1983. https://doi.org/10.1080/09585192.2018.1424016
344. Netland, T. H. (2016). Critical success factors for implementing lean production: The effect of contingencies. *International Journal of Production Research*, *54*(8), 2433–2448. https://doi.org/10.1080/00207543.2015.1096976
345. Netland, T. H., Schloetzer, J. D., & Ferdows, K. (2015). Implementing corporate lean programs: The effect of management control practices. *Journal of Operations Management*, *36*(1), 90–102. https://doi.org/10.1016/j.jom.2015.03.005
346. Ng, T. W., Butts, M. M., Vandenberg, R. J., DeJoy, D. M., & Wilson, M. G. (2006). Effects of management communication, opportunity for learning, and work schedule flexibility on organizational commitment. *Journal of Vocational Behavior*, *68*(3), 474–489.
347. Ng, T. W., & Sorensen, K. L. (2008). Toward a further understanding of the relationships between perceptions of support and work attitudes: A meta-analysis. *Group & Organization Management*, *33*(3), 243–268.
348. Nguyen, D. M. (2015). A New Application Model of Lean Management in Small and Medium Sized Enterprises. *International Journal of Simulation Modelling*, *14*(2), 289–298. https://doi.org/10.2507/IJSIMM14(2)9.304
349. Niepce, W., & Molleman, E. (1998). Work design issues in lean production from a sociotechnical systems perspective: Neo-Taylorism or the next step in sociotechnical design? *Human Relations*, *51*(3), 259–287.
350. Nikolou-Walker, E., & Lavery, K. (2009). A work-based research assessment of the impact of 'lean manufacturing' on health and safety education within an SME. *Research in Post-Compulsory Education*, *14*(4), 441–458. https://doi.org/10.1080/13596740903360992
351. O'Donnell, M. (1995). Empowerment or Enslavement?: Lean Production, Immigrant Women and Service Work in Public Hospitals. *Labour & Industry: A Journal of the*

Social and Economic Relations of Work, *6*(3), 73–94. https://doi.org/10.1080/10301763.1995.10669145

352. Ohno, T. (1988). *Toyota production system: Beyond large-scale production*. Productivity Press.
353. O'Reilly, S., Kumar, A., & Adam, F. (2015). The role of hierarchical production planning in food manufacturing SMEs. *International Journal of Operations & Production Management*, *35*(10), 1362–1385. https://doi.org/10.1108/IJOPM-04-2014-0157
354. Panizzolo, R., Garengo, P., Sharma, M. K., & Gore, A. (2012). Lean manufacturing in developing countries: Evidence from Indian SMEs. *Production Planning & Control*, *23*(10–11), 769–788. https://doi.org/10.1080/09537287.2011.642155
355. Pankotay, F. M. (2020). *Lean knowledge of Hungarian SMEs and influence of German parent companies*.
356. Parker, M., & Slaughter, J. (1988). Management by stress. *Technology Review*, *91*(7), 37–44.
357. Parker, S. K. (2003). Longitudinal effects of lean production on employee outcomes and the mediating role of work characteristics. *Journal of Applied Psychology*, *88*(4), 620–634. https://doi.org/10.1037/0021-9010.88.4.620
358. Parker, S. K., Axtell, C. M., & Turner, N. (2001). Designing a safer workplace: Importance of job autonomy, communication quality, and supportive supervisors. *Journal of Occupational Health Psychology*, *6*(3), 211.
359. Patterson, M. G., West, M. A., Lawthom, R., & Nickell, S. (1997). *Impact of people management practices on business performance* (Vol. 22). Citeseer.
360. Pearce, A., & Pons, D. (2019). Advancing lean management: The missing quantitative approach. *Operations Research Perspectives*, *6*, 100114. https://doi.org/10.1016/j.orp.2019.100114
361. Pearce, A., Pons, D., & Neitzert, T. (2018). Implementing lean—Outcomes from SME case studies. *Operations Research Perspectives*, *5*, 94–104. https://doi.org/10.1016/j.orp.2018.02.002
362. Pech, M., & Vaněček, D. (2018). Methods of lean production to improve quality in manufacturing. *Quality Innovation Prosperity*, *22*(2), 1–15. https://doi.org/10.12776/qip.v22i2.1096
363. Pereira, L. G., & Tortorella, G. L. (2018). A Literature Review on Lean Manufacturing in Small Manufacturing Companies. In J. P. Davim (Ed.), *Progress in Lean Manufacturing* (pp. 69–89). Springer International Publishing. https://doi.org/10.1007/978-3-319-73648-8_3
364. Pfeffer, J. (2001). Fighting the war for talent is hazardous to your organization's health. *Organizational Dynamics*, *29*(4), 248–259.
365. Ping-yu, Y. (2009). The barriers to SMEs implementation of lean production and its countermeasures–based on SMEs in Wenzhou. *Reform Strategy*, *1*(1), 148–151.

366. Pitta, D. A. (2008). Product innovation and management in a small enterprise. *Journal of Product & Brand Management*, *17*(6), 416–419. https://doi.org/10.1108/10610420810904167
367. Podsakoff, N. P., LePine, J. A., & LePine, M. A. (2007). Differential challenge stressor-hindrance stressor relationships with job attitudes, turnover intentions, turnover, and withdrawal behavior: A meta-analysis. *Journal of Applied Psychology*, *92*(2), 438.
368. Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annual Review of Psychology*, *63*, 539–569.
369. Poppendieck, M., Llc, P., Lane, C., & Prairie, E. (2011). Principles of Lean Thinking. *IT Management Select*, *18*, 1–7.
370. Powell, T. C. (1995). Total quality management as competitive advantage: A review and empirical study. *Strategic Management Journal*, *16*(1), 15–37.
371. Power, D. J., & Sohal, A. S. (1997). An examination of the literature relating to issues affecting the human variable in just-in-time environments. *Technovation*, *17*(11–12), 649–666.
372. Prasanna, M., & Vinodh, S. (2013). Lean Six Sigma in SMEs: An exploration through literature review. *Journal of Engineering, Design and Technology*, *11*(3), 224–250. https://doi.org/10.1108/JEDT-01-2011-0001
373. Procter, S., & Radnor, Z. (2014). Teamworking under Lean in UK public services: Lean teams and team targets in Her Majesty's Revenue & Customs (HMRC). *The International Journal of Human Resource Management*, *25*(21), 2978–2995. https://doi.org/10.1080/09585192.2014.953976
374. Puvanasvaran, P., Megat, H., Sai Hong, T., & Mohd.Razali, M. (2009). The roles of communication process for an effective lean manufacturing implementation. *Journal of Industrial Engineering and Management*, *2*(1), 128–152. https://doi.org/10.3926/jiem.2009.v2n1.p128-152
375. Quattrochi-Tubin, S. J., Jones, J. W., & Breedlove, V. (1982). The burnout syndrome in geriatric counselors and service workers. *Activities, Adaptation & Aging*, *3*(1), 65–76.
376. Qureshi, K. M., Mewada, Bhavesh. G., Alghamdi, S. Y., Almakayeel, N., Qureshi, M. R. N., & Mansour, M. (2022). Accomplishing Sustainability in Manufacturing System for Small and Medium-Sized Enterprises (SMEs) through Lean Implementation. *Sustainability*, *14*(15), 9732. https://doi.org/10.3390/su14159732
377. Ramadas & Satish. (2021). Identification and modeling of process barriers: Implementing lean manufacturing in small-and medium-size enterprises. *International Journal of Lean Six Sigma*, *12*(1), Article 1. https://doi.org/10.1108/IJLSS-09-2016-0044
378. Ramadas, T., & Satish, K. P. (2018). Identification and modeling of employee barriers while implementing lean manufacturing in small- and medium-scale

enterprises. *International Journal of Productivity and Performance Management*, *67*(3), 467–486. https://doi.org/10.1108/IJPPM-10-2016-0218

379. Ramakrishnan, V., & Nallusamy, S. (2017). Implementation of total productive maintenance lean tool to reduce lead time-A case study. *International Journal of Mechanical Engineering and Technology*, *8*(12), 295–306.
380. Ramos-Villagrasa, P. J., Barrada, J. R., Fernández-del-Río, E., & Koopmans, L. (2019). Assessing Job Performance Using Brief Self-report Scales: The Case of the Individual Work Performance Questionnaire. *Revista de Psicología Del Trabajo y de Las Organizaciones*, *35*(3), Article 3. https://doi.org/10.5093/jwop2019a21
381. Randall, M., & Scott, W. A. (1988). Burnout, job satisfaction, and job performance. *Australian Psychologist*, *23*(3), 335–347.
382. Rastogi, A., Pati, S. P., Dixit, J. K., & Kumar, P. (2018). Work disengagement among SME workers: Evidence from India. *Benchmarking: An International Journal*, *25*(3), Article 3. https://doi.org/10.1108/BIJ-07-2017-0189
383. Rauch, E., Dallasega, P., & Matt, D. T. (2017). Critical Factors for Introducing Lean Product Development to Small and Medium sized Enterprises in Italy. *Procedia CIRP*, *60*, 362–367. https://doi.org/10.1016/j.procir.2017.01.031
384. Rizzo, J. R., House, R. J., & Lirtzman, S. I. (1970). Role conflict and ambiguity in complex organizations. *Administrative Science Quarterly*, 150–163. https://doi.org/10.2307/2391486
385. Roberts, J. (2014). *Lean Management Pilosophy and Its Impact on Employee Attitudes and Performance: The Critical Role of First Line Supervisors*.
386. Robinson, A. G., & Schroeder, D. M. (2009). The Role of Front-Line Ideas in Lean Performance Improvement. *Quality Management Journal*, *16*(4), Article 4. https://doi.org/10.1080/10686967.2009.11918248
387. Rodríguez, D., Van Landeghem, H., Lasio, V., & Buyens, D. (2017). Determinants of job satisfaction in a lean environment. *International Journal of Lean Six Sigma*, *8*(2), Article 2. https://doi.org/10.1108/IJLSS-01-2016-0002
388. Ronen, S., & Sadan, S. (1984). Job attitudes among different occupational status groups: An economic analysis. *Work and Occupations*, *11*(1), 77–97.
389. Rose, A., Deros, B. M., Rahman, M. A., & Nordin, N. (2011). *Lean manufacturing best practices in SMEs*. *2*(5), 872–877.
390. Rose, A. N. M., Deros, B. M., & Rahman, M. N. A. (2013). Lean Manufacturing Practices Implementation in Malaysian's SME Automotive Component Industry. *Applied Mechanics and Materials*, *315*, 686–690. https://doi.org/10.4028/www.scientific.net/AMM.315.686
391. Roth, N., & Franchetti, M. (2010). Process improvement for printing operations through the DMAIC Lean Six Sigma approach: A case study from Northwest Ohio, USA. *International Journal of Lean Six Sigma*, *1*(2), Article 2. https://doi.org/10.1108/20401461011049502

392. Rymaszewska, A. D. (2014). The challenges of lean manufacturing implementation in SMEs. *Benchmarking: An International Journal*, *21*(6), 987–1002. https://doi.org/10.1108/BIJ-10-2012-0065
393. Saboo, A., Garza-Reyes, J. A., Er, A., & Kumar, V. (2014). A VSM improvement-based approach for lean operations in an Indian manufacturing SME. *International Journal of Lean Enterprise Research*, *1*(1), 41–58.
394. Sadikoglu, E., & Zehir, C. (2010). Investigating the effects of innovation and employee performance on the relationship between total quality management practices and firm performance: An empirical study of Turkish firms. *International Journal of Production Economics*, *127*(1), 13–26.
395. Sahoo, S., & Yadav, S. (2018). Lean implementation in small- and medium-sized enterprises: An empirical study of Indian manufacturing firms. *Benchmarking: An International Journal*, *25*(4), 1121–1147. https://doi.org/10.1108/BIJ-02-2017-0033
396. Saks, A. M. (2006). Antecedents and consequences of employee engagement. *Journal of Managerial Psychology*, *21*(7), Article 7. https://doi.org/10.1108/02683940610690169
397. Sakthi Nagaraj, T., Jeyapaul, R., Vimal, K. E. K., & Mathiyazhagan, K. (2019). Integration of human factors and ergonomics into lean implementation: Ergonomic-value stream map approach in the textile industry. *Production Planning & Control*, *30*(15), 1265–1282. https://doi.org/10.1080/09537287.2019.1612109
398. Salanova, M., Agut, S., & Peiró, J. M. (2005). Linking Organizational Resources and Work Engagement to Employee Performance and Customer Loyalty: The Mediation of Service Climate. *Journal of Applied Psychology*, *90*(6), 1217–1227. https://doi.org/10.1037/0021-9010.90.6.1217
399. Salma, A., Anas, C., & Mohammed, E. H. (2018). How can Top management succeed in a lean manufacturing implementation in the small and medium sized enterprises? *2018 International Colloquium on Logistics and Supply Chain Management (LOGISTIQUA)*, 176–181. https://doi.org/10.1109/LOGISTIQUA.2018.8428287
400. Salma, A., Anas, C., & Mohammed, E. H. (2021). Bibliographic Study on the Difficulties Encountered by SMEs During the Implementation of Lean Manufacturing. *Journal of Advanced Manufacturing Systems*, *20*(01), Article 01. https://doi.org/10.1142/S0219686721500098
401. Samson, D., & Terziovski, M. (1999). The relationship between total quality management practices and operational performance. *Journal of Operations Management*, *17*(4), 393–409.
402. Santos, Z. G. dos, Vieira, L., & Balbinotti, G. (2015). Lean Manufacturing and Ergonomic Working Conditions in the Automotive Industry. *6th International Conference on Applied Human Factors and Ergonomics (AHFE 2015) and the Affiliated Conferences, AHFE 2015*, *3*, 5947–5954. https://doi.org/10.1016/j.promfg.2015.07.687

403. Sardeshmukh, S. R., Sharma, D., & Golden, T. D. (2012). Impact of telework on exhaustion and job engagement: A job demands and job resources model: Impact of telework on exhaustion and job engagement. *New Technology, Work and Employment*, *27*(3), Article 3. https://doi.org/10.1111/j.1468-005X.2012.00284.x
404. Saridakis, G., Muñoz Torres, R., & Johnstone, S. (2013). Do Human Resource Practices Enhance Organizational Commitment in SMEs with Low Employee Satisfaction?: Organizational Commitment in SMEs. *British Journal of Management*, *24*(3), 445–458. https://doi.org/10.1111/j.1467-8551.2012.00814.x
405. Sasser, M., & Sørensen, O. H. (2016). Doing a good job—The effect of primary task quality on well-being and job satisfaction. *Human Factors and Ergonomics in Manufacturing & Service Industries*, *26*(3), 323–336.
406. Saunders, M. N., Gray, D. E., & Goregaokar, H. (2014). SME innovation and learning: The role of networks and crisis events. *European Journal of Training and Development*, *38*(1/2), 136–149. https://doi.org/10.1108/EJTD-07-2013-0073
407. Saurin, T. A., & Ferreira, C. F. (2009). The impacts of lean production on working conditions: A case study of a harvester assembly line in Brazil. *International Journal of Industrial Ergonomics*, *39*(2), 403–412.
408. Scanlan, J. N., & Still, M. (2019). Relationships between burnout, turnover intention, job satisfaction, job demands and job resources for mental health personnel in an Australian mental health service. *BMC Health Services Research*, *19*(1), 62. https://doi.org/10.1186/s12913-018-3841-z
409. Schaufeli, W. B. (2015). Engaging leadership in the job demands-resources model. *Career Development International*, *20*(5), 446–463. https://doi.org/10.1108/CDI-02-2015-0025
410. Schaufeli, W. B. (2017). Applying the Job Demands-Resources model. *Organizational Dynamics*, *46*(2), 120–132. https://doi.org/10.1016/j.orgdyn.2017.04.008
411. Schaufeli, W. B., & Bakker, A. B. (2004). Job demands, job resources, and their relationship with burnout and engagement: A multi-sample study. *Journal of Organizational Behavior*, *25*(3), 293–315. https://doi.org/10.1002/job.248
412. Schaufeli, W. B., Bakker, A. B., & Salanova, M. (2006). The Measurement of Work Engagement With a Short Questionnaire: A Cross-National Study. *Educational and Psychological Measurement*, *66*(4), 701–716. https://doi.org/10.1177/0013164405282471
413. Schaufeli, W. B., Bakker, A. B., & Van Rhenen, W. (2009). How changes in job demands and resources predict burnout, work engagement, and sickness absenteeism. *Journal of Organizational Behavior: The International Journal of Industrial, Occupational and Organizational Psychology and Behavior*, *30*(7), 893–917.
414. Schaufeli, W. B., Salanova, M., González-Romá, V., & Bakker, A. B. (2002). The measurement of engagement and burnout: A two sample confirmatory factor analytic approach. *Journal of Happiness Studies*, *3*, 71–92.

415. Schaufeli, W. B., & Taris, T. W. (2014). A Critical Review of the Job Demands-Resources Model: Implications for Improving Work and Health. In G. F. Bauer & O. Hämmig, *Bridging Occupational, Organizational and Public Health* (pp. 43–68). Springer Netherlands. https://doi.org/10.1007/978-94-007-5640-3_4
416. Schermelleh-Engel, K., Moosbrugger, H., & Müller, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research Online*, *8*(2), 23–74.
417. Scherrer-Rathje, M., Boyle, T. A., & Deflorin, P. (2009). Lean, take two! Reflections from the second attempt at lean implementation. *Business Horizons*, *52*(1), 79–88. https://doi.org/10.1016/j.bushor.2008.08.004
418. Schmidt, S. (2011). From Hype to Ignorance–A Review of 30 Years of Lean Production. *International Journal of Economics and Management Engineering*, *5*(1), 82–85.
419. Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A., & King, J. (2006). Reporting structural equation modeling and confirmatory factor analysis results: A review. *The Journal of Educational Research*, *99*(6), 323–338.
420. Secchi, R., & Camuffo, A. (2019). Lean implementation failures: The role of organizational ambidexterity. *International Journal of Production Economics*, *210*, 145–154. https://doi.org/10.1016/j.ijpe.2019.01.007
421. Seppälä, P., & Klemola, S. (2004). How do employees perceive their organization and job when companies adopt principles of lean production?: Organizations, Jobs, and Lean Production. *Human Factors and Ergonomics in Manufacturing & Service Industries*, *14*(2), 157–180. https://doi.org/10.1002/hfm.10059
422. Shah, R., Chandrasekaran, A., & Linderman, K. (2008). In pursuit of implementation patterns: The context of Lean and Six Sigma. *International Journal of Production Research*, *46*(23), 6679–6699. https://doi.org/10.1080/00207540802230504
423. Shah, R., & Goldstein, S. M. (2006). Use of structural equation modeling in operations management research: Looking back and forward. *Journal of Operations Management*, *24*(2), 148–169.
424. Shah, R., & Ward, P. T. (2003). Lean manufacturing: Context, practice bundles, and performance. *Journal of Operations Management*, *21*(2), Article 2. https://doi.org/10.1016/S0272-6963(02)00108-0
425. Shah, R., & Ward, P. T. (2007). Defining and developing measures of lean production. *Journal of Operations Management*, *25*(4), 785–805. https://doi.org/10.1016/j.jom.2007.01.019
426. Shang, G., & Sui Pheng, L. (2014). Barriers to lean implementation in the construction industry in China. *Journal of Technology Management in China*, *9*(2), Article 2. https://doi.org/10.1108/JTMC-12-2013-0043
427. Shevchuk, A., Strebkov, D., & Davis, S. N. (2018b). Work value orientations and worker well-being in the new economy: Implications of the job demands-resources model among internet freelancers. *International Journal of Sociology and Social Policy*, *38*(9/10), Article 9/10. https://doi.org/10.1108/IJSSP-01-2018-0006

428. Shokri, A., Waring, T. S., & Nabhani, F. (2016). Investigating the readiness of people in manufacturing SMEs to embark on Lean Six Sigma projects: An empirical study in the German manufacturing sector. *International Journal of Operations & Production Management*, *36*(8), 850–878. https://doi.org/10.1108/IJOPM-11-2014-0530
429. Shrimali, A. K., & Soni, V. (2017). Barriers to lean implementation in small and medium-sized Indian enterprises. *International Journal of Mechanical Engineering and Technology*, *8*(6), 1–9.
430. Siegel, R., Antony, J., Garza-Reyes, J. A., Cherrafi, A., & Lameijer, B. (2019). Integrated green lean approach and sustainability for SMEs: From literature review to a conceptual framework. *Journal of Cleaner Production*, *240*, 118205. https://doi.org/10.1016/j.jclepro.2019.118205
431. Siegrist, J. (1996). Adverse health effects of high-effort/low-reward conditions. *Journal of Occupational Health Psychology*, *1*(1), 27.
432. Singh, B., & Sharma, S. K. (2009). Value stream mapping as a versatile tool for lean implementation: An Indian case study of a manufacturing firm. *Measuring Business Excellence*, *13*(3), Article 3. https://doi.org/10.1108/13683040910984338
433. Singh, M., & Rathi, R. (2021). Investigation and modeling of lean six sigma barriers in small and medium-sized industries using hybrid ISM-SEM approach. *International Journal of Lean Six Sigma*, *12*(6), 1115–1145. https://doi.org/10.1108/IJLSS-09-2020-0146
434. Singh, R., Gohil, A. M., Shah, D. B., & Desai, S. (2013). Total productive maintenance (TPM) implementation in a machine shop: A case study. *Procedia Engineering*, *51*, 592–599.
435. Smith, A. D. (2010). Service quality programme developments and lean management aspects: A multi-case study. *International Journal of Services and Operations Management*, *7*(1), 1–23.
436. Smith, M. H., & Smith, D. (2007). Implementing strategically aligned performance measurement in small firms. *International Journal of Production Economics*, *106*(2), Article 2.
437. Smith, M., Paton, S., & MacBryde, J. (2018). Lean implementation in a service factory: Views from the front-line. *Production Planning & Control*, *29*(4), Article 4. https://doi.org/10.1080/09537287.2017.1418455
438. Snell, S. A., & Dean Jr, J. W. (1994). Strategic compensation for integrated manufacturing: The moderating effects of jobs and organizational inertia. *Academy of Management Journal*, *37*(5), 1109–1140.
439. Sobhani, A., Wahab, M., & Neumann, W. P. (2015). Investigating work-related ill health effects in optimizing the performance of manufacturing systems. *European Journal of Operational Research*, *241*(3), 708–718.
440. Sobhani, A., Wahab, M., & Neumann, W. P. (2017). Incorporating human factors-related performance variation in optimizing a serial system. *European Journal of Operational Research*, *257*(1), 69–83.

441. Sofijanova, E., & Zabijakin-Chatleska, V. (2013). *Employee involvement and organizational performance: Evidence from the manufacturing sector in Republic of Macedonia*.
442. Sonnentag, S. (2003). Recovery, work engagement, and proactive behavior: A new look at the interface between nonwork and work. *Journal of Applied Psychology*, *88*(3), 518.
443. Sony, M., & Mekoth, N. (2019). Broadening the Lean Six Sigma concept through employee adaptability: A literature review. *International Journal of Productivity and Quality Management*, *28*(3), 279–298.
444. Sousa, P., Tereso, A., Alves, A., & Gomes, L. (2018). Implementation of project management and lean production practices in a SME Portuguese innovation company. *Procedia Computer Science*, *138*, 867–874. https://doi.org/10.1016/j.procs.2018.10.113
445. Spann, M. S., Adams, M., Rahman, M., Czarnecki, H., & Schroer, B. J. (1999). Transferring lean manufacturing to small manufacturers: The role of NIST-MEP. *University of Alabama in Huntsville*.
446. Spasojevic Brkic, V., & Tomic, B. (2016). Employees factors importance in Lean Six Sigma concept. *The TQM Journal*, *28*(5), 774–785. https://doi.org/10.1108/TQM-10-2015-0131
447. Stamm, C. L., & Golhar, D. Y. (1991). Customer and supplier linkages for small JIT manufacturing firms. *Journal of Small Business Management*, *29*(3), 43.
448. Stanica, S., & Peydro, J. (2016). How does the employee cross-training lean tool affect the knowledge transfer in product development processes? *VINE Journal of Information and Knowledge Management Systems*, *46*(3), 371–385. https://doi.org/10.1108/VJIKMS-11-2015-0061
449. Stenfors-Hayes, T., Hasson, H., Augustsson, H., Forsberg, H. H., & von Thiele Schwarz, U. (2016). Merging occupational health, safety and health promotion with Lean: An integrated systems approach (the LeanHealth project). In *Creating Healthy Workplaces* (pp. 281–298). Routledge.
450. Sterling, A., & Boxall, P. (2013). Lean production, employee learning and workplace outcomes: A case analysis through the ability-motivation-opportunity framework: Employee learning under lean production. *Human Resource Management Journal*, *23*(3), Article 3. https://doi.org/10.1111/1748-8583.12010
451. Stewart, P., Murphy, K., Danford, A., Richardson, T., Richardson, M., & Wass, V. J. (2009). *We sell our time no more: Workers' struggles against lean production in the British car industry*. Pluto Press.
452. Stone, K. B. (2012). Lean Transformation: Organizational Performance Factors that Influence Firms' Leanness. *Journal of Enterprise Transformation*, *2*(4), 229–249. https://doi.org/10.1080/19488289.2012.664611
453. Strange, W. (2012). Interview with Andrew Kilshaw, Chief Learning Officer at Nike Inc. *Development and Learning in Organizations: An International Journal*, *26*(3), 32–34.

454. Supyuenyong, V., Islam, N., & Kulkarni, U. (2009). Influence of SME characteristics on knowledge management processes: The case study of enterprise resource planning service providers. *Journal of Enterprise Information Management*.
455. Suzuki, T. (2017). *TPM in process industries*. Routledge.
456. Tajri, I., & Cherkaoui, A. (2015). Modeling the complexity of the relationship (Lean, company, employee and cognitive ergonomics) case of Moroccan SMEs. *2015 International Conference on Industrial Engineering and Systems Management (IESM)*, 1286–1295. https://doi.org/10.1109/IESM.2015.7380318
457. Tam, S., & Gray, D. E. (2016a). Organisational learning and the organisational life cycle: The differential aspects of an integrated relationship in SMEs. *European Journal of Training and Development*.
458. Tam, S., & Gray, D. E. (2016b). The practice of employee learning in SME workplaces: A micro view from the life-cycle perspective. *Journal of Small Business and Enterprise Development*, *23*(3), 671–690. https://doi.org/10.1108/JSBED-07-2015-0099
459. Tan, K. H., Denton, P., Rae, R., & Chung, L. (2013). Managing lean capabilities through flexible workforce development: A process and framework. *Production Planning & Control*, *24*(12), 1066–1076. https://doi.org/10.1080/09537287.2011.646013
460. Tanco, M., Santos, J., Rodriguez, J. L., & Reich, J. (2013). Applying lean techniques to nougat fabrication: A seasonal case study. *The International Journal of Advanced Manufacturing Technology*, *68*(5–8), 1639–1654.
461. Taris, T. W., & Schreurs, P. J. G. (2009). Well-being and organizational performance: An organizational-level test of the happy-productive worker hypothesis. *Work & Stress*, *23*(2), 120–136. https://doi.org/10.1080/02678370903072555
462. Taylor, A., & Taylor, M. (2014). Factors influencing effective implementation of performance measurement systems in small and medium-sized enterprises and large firms: A perspective from Contingency Theory. *International Journal of Production Research*, *52*(3), 847–866. https://doi.org/10.1080/00207543.2013.842023
463. Teixeira, H. N., Lopes, I., & Sousa, S. (2015). Prioritizing quality problems in SMEs: A methodology. *The TQM Journal*.
464. Terglav, K., Konečnik Ruzzier, M., & Kaše, R. (2016). Internal branding process: Exploring the role of mediators in top management's leadership–commitment relationship. *International Journal of Hospitality Management*, *54*, 1–11. https://doi.org/10.1016/j.ijhm.2015.12.007
465. Thanki, S. J., & Thakkar, J. (2014). Status of lean manufacturing practices in Indian industries and government initiatives. *Journal of Manufacturing Technology Management*, *25*(5), 655–675. https://doi.org/10.1108/JMTM-05-2012-0057
466. 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

467. Thomas, A., & Barton, R. (2006). Developing an SME based six sigma strategy. *Journal of Manufacturing Technology Management*, *17*(4), 417–434. https://doi.org/10.1108/17410380610662852
468. Thomé, A. M. T., Scavarda, L. F., & Scavarda, A. J. (2016). Conducting systematic literature review in operations management. *Production Planning & Control*, *27*(5), 408–420. https://doi.org/10.1080/09537287.2015.1129464
469. Timans, W., Ahaus, K., van Solingen, R., Kumar, M., & Antony, J. (2016). Implementation of continuous improvement based on Lean Six Sigma in small- and medium-sized enterprises. *Total Quality Management & Business Excellence*, *27*(3–4), 309–324. https://doi.org/10.1080/14783363.2014.980140
470. Timans, W., Antony, J., Ahaus, K., & van Solingen, R. (2012). Implementation of Lean Six Sigma in small- and medium-sized manufacturing enterprises in the Netherlands. *Journal of the Operational Research Society*, *63*(3), 339–353. https://doi.org/10.1057/jors.2011.47
471. Tortorella, G. L., & Fogliatto, F. S. (2014). Method for assessing human resources management practices and organisational learning factors in a company under lean manufacturing implementation. *International Journal of Production Research*, *52*(15), 4623–4645. https://doi.org/10.1080/00207543.2014.881577
472. Tortorella, G. L., Marodin, G. A., Fogliatto, F. S., & Miorando, R. (2015). Learning organisation and human resources management practices: An exploratory research in medium-sized enterprises undergoing a lean implementation. *International Journal of Production Research*, *53*(13), 3989–4000. https://doi.org/10.1080/00207543.2014.980462
473. Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*, *14*(3), 207–222.
474. Tucker, A. L., Edmondson, A. C., & Spear, S. (2002). When problem solving prevents organizational learning. *Journal of Organizational Change Management*, *15*(2), 122–137.
475. Tushman, M., & Nadler, D. (1986). Organizing for innovation. *California Management Review*, *28*(3), 74–92.
476. Tyagi, S., Cai, X., Yang, K., & Chambers, T. (2015). Lean tools and methods to support efficient knowledge creation. *International Journal of Information Management*, *35*(2), 204–214.
477. Ulhassan, W., Sandahl, C., Westerlund, H., Henriksson, P., Bennermo, M., Schwarz, U. von T., & Thor, J. (2013). Antecedents and Characteristics of Lean Thinking Implementation in a Swedish Hospital: A Case Study. *Quality Management in Health Care*, *22*(1), 48–61. https://doi.org/10.1097/QMH.0b013e31827dec5a
478. Ulhassan, W., von Thiele Schwarz, U., Thor, J., & Westerlund, H. (2014). Interactions between lean management and the psychosocial work environment in a hospital setting – a multi-method study. *BMC Health Services Research*, *14*(1), Article 1. https://doi.org/10.1186/1472-6963-14-480

479. Vakola, M. (2014). What's in there for me? Individual readiness to change and the perceived impact of organizational change. *Leadership & Organization Development Journal*, *35*(3), 195–209. https://doi.org/10.1108/LODJ-05-2012-0064
480. Valente, C. M., Sousa, P. S. A., & Moreira, M. R. A. (2019). Assessment of the Lean effect on business performance: The case of manufacturing SMEs. *Journal of Manufacturing Technology Management*, *31*(3), 501–523. Scopus. https://doi.org/10.1108/JMTM-04-2019-0137
481. Valverde-Curi, H., De-La-Cruz-Angles, A., Cano-Lazarte, M., Alvarez, J. M., & Raymundo-Ibañez, C. (2019). Lean Management Model for Waste Reduction in the Production Area of A Food Processing and Preservation SME. *Proceedings of the 2019 5th International Conference on Industrial and Business Engineering - ICIBE 2019*, 256–260. https://doi.org/10.1145/3364335.3364378
482. Van den Broeck, A., De Cuyper, N., De Witte, H., & Vansteenkiste, M. (2010). Not all job demands are equal: Differentiating job hindrances and job challenges in the Job Demands–Resources model. *European Journal of Work and Organizational Psychology*, *19*(6), 735–759.
483. Van den Broeck, A., Vansteenkiste, M., De Witte, H., & Lens, W. (2008). Explaining the relationships between job characteristics, burnout, and engagement: The role of basic psychological need satisfaction. *Work & Stress*, *22*(3), 277–294. https://doi.org/10.1080/02678370802393672
484. van Dun, D. H., Hicks, J. N., & Wilderom, C. P. M. (2017). Values and behaviors of effective lean managers: Mixed-methods exploratory research. *European Management Journal*, *35*(2), 174–186. https://doi.org/10.1016/j.emj.2016.05.001
485. van Dun, D. H., & Uittenbogaard, P. (2017). *Lean leaders inspiring employee engagement in a healthcare setting*. 24th International Annual EurOMA Conference 2017: Inspiring Operations Management.
486. Van Goubergen, D., Dora, M., Molnar, A., Gellynck, X., & Kumar, M. (2011). *Lean application among European food SMEs: Findings from empirical research*. 1.
487. Vassos, M. V., & Nankervis, K. L. (2012). Investigating the importance of various individual, interpersonal, organisational and demographic variables when predicting job burnout in disability support workers. *Research in Developmental Disabilities*, *33*(6), 1780–1791.
488. Vidal, M. (2007). Lean Production, Worker Empowerment, and Job Satisfaction: A Qualitative Analysis and Critique. *Critical Sociology*, *33*(1–2), 247–278. https://doi.org/10.1163/156916307X168656
489. Vienazindiene, M., & Ciarniene, R. (2013). Lean manufacturing implementation and progress measurement. *Economics and Management*, *18*(2), 366–373.
490. Vilda, F. G., Yagüe Fabra, J. A., & Torrents, A. S. (2019). Person-Based Design: A Human-Centered Approach for Lean Factory Design. *Procedia Manufacturing*, *41*, 445–452. https://doi.org/10.1016/j.promfg.2019.09.031

491. Wall, T. D., Jackson, P. R., & Mullarkey, S. (1995). Further evidence on some new measures of job control, cognitive demand and production responsibility. *Journal of Organizational Behavior*, *16*(5), Article 5. https://doi.org/10.1002/job.4030160505
492. Wangwacharakul, P., Berglund, M., Harlin, U., & Gullander, P. (2014). Cultural aspects when implementing lean production and lean product development -experiences from a Swedish perspective. *Quality Innovation Prosperity*, *18*(1), 125–140. https://doi.org/10.12776/QIP.V18I1.321
493. Wester, L. C., & Hitka, M. (2022). Shopfloor Management – A Tool of Lean Management. *Management Systems in Production Engineering*, *30*(3), Article 3. https://doi.org/10.2478/mspe-2022-0030
494. White, R. E., Pearson, J. N., & Wilson, J. R. (1999). JIT Manufacturing: A Survey of Implementations in Small and Large U.S. Manufacturers. *Management Science*, *45*(1), 1–15. https://doi.org/10.1287/mnsc.45.1.1
495. Wickramasinghe, G. L. D., & Wickramasinghe, V. (2016). Effects of continuous improvement on shop-floor employees' job performance in Lean production: The role of Lean duration. *Research Journal of Textile and Apparel*, *20*(4), 182–194. https://doi.org/10.1108/RJTA-07-2016-0014
496. Wickramasinghe, V., & Wickramasinghe, G. L. D. (2016). Variable pay and job performance of shop-floor workers in lean production. *Journal of Manufacturing Technology Management*, *27*(2), Article 2. https://doi.org/10.1108/JMTM-12-2014-0130
497. Widyanti, A., & Larutama, W. (2016). The relation between performance of lean Manufacturing and employee' mental workload. *2016 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM)*, 252–256. https://doi.org/10.1109/IEEM.2016.7797875
498. Williams, K., Haslam, C., Williams, J., Cultler, T., Adcroft, A., & Johal, S. (1992). Against lean production. *Economy and Society*, *21*(3), 321–354.
499. Willmott, P., & McCarthy, D. (2000). *TPM-: A Route to World Class Performance*. Newnes.
500. Wollter Bergman, M., Berlin, C., Babapour Chafi, M., Falck, A.-C., & Örtengren, R. (2021). Cognitive Ergonomics of Assembly Work from a Job Demands–Resources Perspective: Three Qualitative Case Studies. *International Journal of Environmental Research and Public Health*, *18*(23), 12282. https://doi.org/10.3390/ijerph182312282
501. Womack, J. P. (2007). Moving beyond the tool age [Lean management]. *Manufacturing Engineer*, *86*(1), 4–5.
502. Womack, J. P., & Jones, D. T. (1996). Beyond Toyota: How to root out waste and pursue perfection. *Harvard Business Review*, *74*(5), 140–172.
503. Womack, J. P., & Jones, D. T. (2003). *Lean thinking: Banish waste and create wealth in your corporation* (1st Free Press ed., rev.updated). Free Press.
504. Womack, James P. Jones, Daniel T. Roos, Daniel. (1990). *The machine that changed the world*.

505. Wong, K. Y., & Aspinwall, E. (2004). Characterizing knowledge management in the small business environment. *Journal of Knowledge Management*.
506. Wong, Y. C., Wong, K. Y., & Ali, A. (2009). A study on lean manufacturing implementation in the Malaysian electrical and electronics industry. *European Journal of Scientific Research*, *38*(4), 521–535.
507. Worley, J. M., & Doolen, T. L. (2006). The role of communication and management support in a lean manufacturing implementation. *Management Decision*, *44*(2), 228–245. https://doi.org/10.1108/00251740610650210
508. Worley, J. M., & Doolen, T. L. (2015). Organizational structure, employee problem solving, and lean implementation. *International Journal of Lean Six Sigma*, *6*(1), 39–58. https://doi.org/10.1108/IJLSS-12-2013-0058
509. Wright, T. A., & Bonett, D. G. (1997). The contribution of burnout to work performance. *Journal of Organizational Behavior: The International Journal of Industrial, Occupational and Organizational Psychology and Behavior*, *18*(5), 491–499.
510. Wright, T. A., & Cropanzano, R. (1998). Emotional exhaustion as a predictor of job performance and voluntary turnover. *Journal of Applied Psychology*, *83*(3), 486.
511. Wright, T. A., Cropanzano, R., & Bonett, D. G. (2007). The moderating role of employee positive well being on the relation between job satisfaction and job performance. *Journal of Occupational Health Psychology*, *12*(2), 93.
512. Wu, N., Bacon, N., & Hoque, K. (2014). The adoption of high performance work practices in small businesses: The influence of markets, business characteristics and HR expertise. *The International Journal of Human Resource Management*, *25*(8), 1149–1169.
513. Xanthopoulou, D., Bakker, A. B., Demerouti, E., & Schaufeli, W. B. (2007a). The role of personal resources in the job demands-resources model. *International Journal of Stress Management*, *14*(2), 121–141. https://doi.org/10.1037/1072-5245.14.2.121
514. Xanthopoulou, D., Bakker, A. B., Demerouti, E., & Schaufeli, W. B. (2009). Reciprocal relationships between job resources, personal resources, and work engagement. *Journal of Vocational Behavior*, *74*(3), 235–244. https://doi.org/10.1016/j.jvb.2008.11.003
515. Yadav, V., Jain, R., Mittal, M. L., Panwar, A., & Lyons, A. (2019a). The impact of lean practices on the operational performance of SMEs in India. *Industrial Management & Data Systems*, *119*(2), Article 2. https://doi.org/10.1108/IMDS-02-2018-0088
516. Yadav, V., Jain, R., Mittal, M. L., Panwar, A., & Lyons, A. C. (2019b). The propagation of lean thinking in SMEs. *Production Planning & Control*, *30*(10–12), Article 10–12. https://doi.org/10.1080/09537287.2019.1582094
517. Yadav, V., Jain, R., Mittal, M. L., Panwar, A., & Sharma, M. K. (2019). An appraisal on barriers to implement lean in SMEs. *Journal of Manufacturing Technology Management*, *30*(1), 195–212. https://doi.org/10.1108/JMTM-12-2017-0262
518. Yeow, J. A., Tan, K. S., Chin, T. S., & Ching, E. S. (2012). *A review on ergonomic factors that lead to stress in manufacturing industry*.

519. Yew Wong, K., & Aspinwall, E. (2004). Characterizing knowledge management in the small business environment. *Journal of Knowledge Management*, *8*(3), 44–61.
520. Yin, R. K. (2018). *Case study research and applications*. Sage.
521. Yuik, C. J., Perumal, P. A., & Feng, C. J. (2020). Exploring critical success factors for the implementation of lean manufacturing in machinery and equipment SMEs. *Engineering Management in Production and Services*, *12*(4), 77–91.
522. Yuik, C. J., & Puvanasvaran, P. (2020). Development of Lean Manufacturing Implementation Framework in Machinery and Equipment SMEs. *International Journal of Industrial Engineering and Management*, *11*(3), 157–169.
523. Yusof, S. M., & Aspinwall, E. (1999). Critical success factors for total quality management implementation in small and medium enterprises. *Total Quality Management*, *10*(4–5), Article 4–5. https://doi.org/10.1080/0954412997839
524. Zhang, L. (2015). Lean production "with Chinese characteristics": A case study of China's automobile industry. *International Journal of Sociology*, *45*(2), 152–170.
525. Zhang, Q., Irfan, M., Khattak, M. A. O., Zhu, X., & Hassan, M. (2012). Lean Six Sigma: A literature review. *Interdisciplinary Journal of Contemporary Research in Business*, *3*(10), 599–605.
526. Zhou, B. (2016). Lean principles, practices, and impacts: A study on small and medium-sized enterprises (SMEs). *Annals of Operations Research*, *241*(1–2), 457–474. https://doi.org/10.1007/s10479-012-1177-3

APPENDICES

Appendix 1: Daljši povzetek (Extended summary in Slovene language)

Title: Z delavci povezani rezultati uporabe vitke proizvodnje v malih in srednje velikih podjetjih

Vitka metodologija, ki ima potencial za znatno izboljšanje uspešnosti in operativne učinkovitosti podjetja, je pridobila precej pozornosti v kontekstu malih in srednje velikih podjetij (MSP). Številne študije so poudarile koristi vitkih praks za MSP, navajajoč izboljšanja v produktivnosti, kakovosti in splošni poslovni uspešnosti (Abreu-Ledón et al., 2018; Belhadi & Touriki, 2016; Marin-Garcia & Bonavia, 2015; Valente et al., 2019; Yadav, Jain, Mittal, Panwar, & Lyons, 2019a). Kljub tem priznanjem prednostim se MSP pogosto srečujejo z edinstvenimi izzivi, ki otežujejo sprejetje vitkih metod v primerjavi z večjimi podjetji.

Ena glavnih ovir za uvedbo vitke metodologije v MSP so specifične omejitve, kot so finančne omejitve, časovne omejitve, kulturne razlike in tehnični izzivi (Achanga et al., 2006; Caldera et al., 2019; Caloghirou et al., 2004; Narula, 2004; Shah & Ward, 2003). Te omejitve, skupaj z velikostjo podjetja, lahko vplivajo na odnose znotraj praks vitkega upravljanja. MSP izkazujejo razlike v zavezanosti zaposlenih, upravljanju uspešnosti in odzivnosti na zahteve strank v primerjavi z večjimi podjetji (Malik & Abdallah, 2020; Saridakis et al., 2013; Siegel et al., 2019; Taylor & Taylor, 2014; Yadav, Jain, Mittal, Panwar, & Lyons, 2019b). Kljub izzivom imajo MSP edinstvene prednosti, ki lahko olajšajo uvedbo vitkih praks. Dejavniki, kot so edinstveni poslovni modeli, poenostavljeni komunikacijski kanali, prilagodljivi proizvodni sistemi in močno vodstvo, lahko MSP olajšajo sprejemanje vitke metodologije v primerjavi z večjimi podjetji (Alkhoraif, Rashid in McLaughlin 2019; Hu et al. 2015).

MSP pogosto oklevajo pri sprejemanju vitkih praks zaradi skrbi glede stroškov uvedbe in zaznanih koristi vitke metodologije (Achanga et al. 2006a; Bhamu in Singh Sangwan 2014; Buehlmann in Fricke 2016). Ko MSP uvedejo vitko metodologijo, so ponavadi selektivna pri izbiri stroškovno učinkovitih praks, ki jih je enostavno vključiti v njihove obstoječe procese. Standardna vitka orodja in prakse, ki jih MSP sprejmejo, vključujejo 5S/6S, vizualno upravljanje, ribjo kost (*Fishbone diagram*), Kanban, Kaizen, raven načrtovanja (*level scheduling*), proizvodnjo v majhnih serijah, menjavo orodij v eni minuti (*single-minute exchange of die*, SMED) in standardno delo (Alkhoraif et al. 2019; Antosz in Stadnicka 2017; Zhou 2016).

Poleg izbire ustreznih vitkih orodij je sodelovanje zaposlenih prav tako temeljni vidik uvedbe vitke metodologije (Hu et al., 2015). Človeški viri, zlasti vključenost zaposlenih, igrajo ključno vlogo pri uspešni izvedbi vitkih praks v organizacijah (Womack & Jones, 2003). Osnovno načelo vitke metodologije se osredotoča na nenehno izboljševanje in zmanjševanje izgub, kar zahteva celovit organizacijski pristop k optimizaciji procesov in odpravljanju neučinkovitosti. Od zaposlenih se pričakuje aktivno sodelovanje pri

prepoznavanju izgub in predlaganju izboljšav, kar poudarja pomen spodbujanja kulture nenehnega izboljševanja znotraj organizacije. Poleg tega vitka proizvodnja zahteva visoko stopnjo odgovornosti delavcev prve linije za njihova delovna področja (Åhlström & Karlsson, 1996; Bendell, 2005). Delavci morajo biti večspretnostni, prilagodljivi (Forza, 1996) in sposobni delati v timih. Kultura vitke metodologije vključuje proaktivno delo, podporo sodelavcev ter redno in učinkovito prispevanje. Dahlgaard & Dahlgaard-Park (2006, str. 572) poudarjata, da "uspeh sistema temelji na sodelovanju vseh". Zato je visoka kakovost delovne uspešnosti delavcev prve linije bistvenega pomena za vzdrževanje vitke metodologije, saj je njihova visoka vključenost v delo (V. Wickramasinghe & Wickramasinghe, 2016) in sodelovanje osrednjega pomena za vitkost (Forza, 1996).

Bistveno je razumeti, kako se delavci prve linije privajajo na vitka orodja in tehnike, ki preoblikujejo njihove delovne naloge (G. L. D. Wickramasinghe in Wickramasinghe 2016), da bi razumeli njihovo delovno uspešnost (Losonci, Demeter in Jenei 2011). Da bi delovali učinkovito, morajo delavci imeti raznolikost spretnosti, odgovorno avtonomijo in podporo pri delu (Angelis et al. 2011), poleg tega pa jim mora vodstvo zagotoviti ustrezno plačilo ali nagrajevanje (V. Wickramasinghe in Wickramasinghe 2016). Uspešnost delavcev je rezultat upravljanja delovne sile in lahko prispeva k uspešnosti podjetja (Appelbaum et al. 2000; Boxall in Macky 2007).

Utemeljitev raziskave

Vitki kontekst, uvedba vitke metodologije in praksa vplivajo na delovno okolje, kar na koncu vpliva na zdravje in dobro počutje zaposlenih (Hasle et al. 2012). Vitka podjetja si prizadevajo zagotoviti delovna okolja, v katerih so delavci motivirani in prispevajo k nenehnemu izboljševanju s svojimi idejami in vpogledi. Delavci so v vitki metodologiji dragoceni viri vpogledov, saj delajo najbližje proizvodni liniji in največ uporabljajo vitka orodja. Delavci prve linije imajo zelo specifično znanje o nalogah (V. Wickramasinghe in Wickramasinghe 2016). S prispevanjem koristnih vpogledov delavci zagotavljajo pretok proizvodnje z minimalnimi napakami, kar je končni cilj vitkosti. Da bi vodje in podjetja omogočili takšno sodelovanje, morajo zagotoviti ustrezno delovno okolje, kjer se delavci počutijo vključeni in ne izčrpani. Kritiki vitkosti omenjajo veliko intenzivnost dela namesto večje vključenosti delavcev (Carter et al. 2013; McMackin in Flood 2019; Mehri 2006; Stewart et al. 2009). Ustrezno oblikovanje delovnih nalog si prizadeva za zagotavljanje angažiranosti ter preprečevanje negativnih vplivov uporabe vitkih orodij in tehnik.

Angažirani delavci so glavni dejavnik uspeha vitkosti (Angelis et al. 2011), vendar le, če je vitka metodologija pravilno izvedena v podjetjih. Številni zaposleni pogosto neradi sodelujejo v vitkih aktivnostih, kot so reševanje problemov, večnamenskost ali sprejemanje odločitev (Vidal 2007), čeprav se od njih pričakuje, da bodo prispevali k nenehnemu izboljševanju s svojimi idejami in vpogledi. Te zadržke je mogoče zmanjšati z oblikovanjem timske strukture dela (Bayo-Moriones, Bello-Pintado in Merino-Díaz-de-Cerio 2008) ali s spodbujanjem usposabljanja, mentorstva in coachinga (Alefari, Salonitis in Xu 2017). Poleg

rednih delovnih nalog morajo delavci tudi obvladati uporabo vitkih orodij in tehnik. To povečuje zapletenost dela in intenzivnost njihovih nalog, kar na koncu vpliva na dobro počutje delavcev.

Kljub koristim vitkih praks lahko uvajanje vitke metodologije predstavlja izziv za organizacije, zlasti glede vpliva na dobro počutje zaposlenih in organizacijsko kulturo. Nekatere študije opozarjajo na možne negativne učinke vitkih praks na uporabo spretnosti, avtonomijo, sprejemanje odločitev in stres na delovnem mestu med zaposlenimi (Parker 2003; Anderson-Connolly et al. 2002a; Bouville in Alis 2014; Stone 2012).

Literatura razpravlja o odnosu med vitkimi praksami ter zdravjem in dobrobitjo zaposlenih, pri čemer so ugotovitve glede celotnega vpliva vitke metodologije na delavce nasprotujoče si. Medtem ko nekateri raziskovalci trdijo, da lahko vitka uvedba negativno vpliva na zdravje zaposlenih in zadovoljstvo pri delu, drugi predlagajo, da lahko vitke prakse pozitivno vplivajo na inovativno vedenje delavcev, zaznavanje zdravja in splošno dobro počutje (Atatsi, Stoffers in Kil 2019; Abdul Hamid et. al., 2020; Bäckström & Ingelsson, 2016;

Uspešna uvedba vitke metodologije v MSP zahteva natančno razumevanje človeškega dejavnika in njegovega vpliva na organizacijsko uspešnost. Raziskovanje vloge zaposlenih, zlasti delavcev prve linije, pri uvajanju vitke metodologije je ključno za maksimiranje koristi vitkih praks in ublažitev morebitnih izzivov. Nadaljnje raziskave so potrebne za poglobitev odnosa med vitko metodologijo in dobrim počutjem zaposlenih ter za prepoznavanje najboljših praks za optimizacijo organizacijske uspešnosti in ohranjanje zdravega delovnega okolja v kontekstu MSP.

Raziskovalni problem in cilj raziskave

Ta študija raziskuje dobro počutje delavcev prve linije (FLE) v vitkih malih in srednje velikih podjetjih (MSP) skozi tri izide za delavce: izčrpanost, angažiranost in delovno uspešnost. Ti konstrukti so že bili obravnavani v literaturi o vitkosti (Cullinane et al., 2014; Huo & Boxall, 2018), vendar ne v kontekstu MSP. Ta kontekst je ključnega pomena za razumevanje, saj se količina literature o vitkosti v MSP povečuje, prav tako pa tudi raziskovanje vitkosti v MSP (Belhadi et al., 2018). Kljub temu raziskave ne dajejo poudarka na dobro počutje delavcev (Bhamu & Singh Sangwan, 2014), zlasti na delavce prve linije. Naša raziskava bo ponudila dragocene in praktične vpoglede v primerno oblikovanje vitkega procesa v MSP, ki omogoča angažiranost delavcev. Poleg tega bo raziskovanje značilnosti delovnih nalog v vitkih MSP in njihovega vpliva na dobro počutje delavcev pomembno prispevalo k trenutni razpravi o pozitivnih in negativnih posledicah vitkosti na delavce – zlasti glede njihove angažiranosti, izčrpanosti in delovne uspešnosti (Hasle et al., 2012; Landsbergis, Cahill, et al., 1999; Parker, 2003).

Opiramo se na Model zahtev in virov pri delu (*Job demands-resources model*, JD-R), kjer se zaposleni soočajo z zahtevami, ki jih nalagajo delodajalci, hkrati pa uporabljajo zagotovljene vire pri delu za zmanjšanje negativnih učinkov zahtev. Te zahteve predstavljajo

katerikoli vidik dela, ki zahteva fizične ali mentalne napore in prinaša določene stroške, kot so fiziološki in psihološki (Demerouti et al., 2001, str. 501). To so lahko zahteve po reševanju problemov (Huo in Boxall 2018), intenzifikacija dela, preobremenjenost z vlogami, delovni ali proizvodni pritiski (Schaufeli in Taris 2014), kar lahko vodi do izčrpanosti (Beraldin et al., 2019; Demerouti et al., 2001; Huo & Boxall, 2018). Drugi del modela predstavljajo viri pri delu; vsi vidiki dela, ki služijo zmanjšanju stroškov, ki jih prinašajo zahteve, pomagajo pri doseganju delovnih ciljev ali spodbujajo osebno rast in napredek (Demerouti et al., 2001, str. 501). Nekateri viri pri delu vključujejo avtonomijo (Dijkhuizen et al. 2016), socialno podporo (s strani nadrejenih ali sodelavcev) (Korunka et al. 2009), povratne informacije o uspešnosti (Schaufeli in Taris 2014) in identiteto naloge. Čeprav so bili že poskusi uporabe modela JD-R v vitkem kontekstu (Beraldin et al., 2019; Cullinane et al., 2014; Huo & Boxall, 2017, 2018), se nobeden od teh raziskovalno ne osredotoča na MSP. Zato obstaja prostor za nadaljnje raziskave za pojasnitev uporabe modela JD-R v vitkem kontekstu v MSP.

Poglobljeno razumevanje vpliva uporabe vitkosti na dobro počutje delavcev v okolju MSP je potrebno (Nawanir et al. 2020). JD-R okvir služi za razumevanje različnih značilnosti delovnih nalog, ki spodbujajo dobro počutje zaposlenih (Lesener et al., 2019). Uporabljali so ga v raziskavah za prepoznavanje predhodnikov izgorelosti na delovnem mestu (Demerouti, Arnold B Bakker, et al. 2001a), za izboljšanje dela in zdravja delavcev (Schaufeli in Taris 2014) ali za raziskovanje motivacijskih procesov (Halbesleben & Bowler, 2007). V tej raziskavi si prizadevamo za boljše razumevanje mehanizmov in procesov, ki zavirajo ali spodbujajo angažiranost zaposlenih, povzročajo izčrpanost in vplivajo na delovno uspešnost v vitkem kontekstu MSP prek modela JD-R. Ko torej govorimo o izidih za delavce (de Treville in Antonakis 2006), v tej disertaciji predstavljajo delovno angažiranost, izčrpanost in delovno uspešnost delavcev v vitkih MSP, podobno kot de Treville & Antonakis (2006), kjer so »izide dela« opredelili kot tri vidike dela, ki se jim zdijo primerni za raziskovanje (uspešnost, zadovoljstvo, odsotnost).

Temeljna predpostavka naše raziskave je, da so značilnosti delovnih nalog, posebej delovne zahteve in delovni viri, ključnega pomena za dobro počutje zaposlenih. Naš model raziskuje dobro počutje delavcev skozi ravnovesje pozitivnih in negativnih značilnosti delovnih nalog. Zlasti preučujemo raven angažiranosti delavcev prve linije v vitkih MSP, raven izčrpanosti, ki je odvisna od zahtev pri delu, in splošen vpliv na delovno uspešnost.

Raziskovalne hipoteze

S to raziskavo potrjujemo uporabnost modela JD-R v kontekstu vitkih MSP. Model nadgrajujemo na podlagi značilnosti vitkih MSP: optimizacije operativnih procesov, poudarjanja zmanjšanja odpadkov (Dora et al. 2014; Grewal 2008; Hu et al. 2015), večje fleksibilnosti in prilagodljivosti (Antony et al. 2017), ter manj organizacijskih slojev (Dowlatshahi in Taham 2009; Huber in Brown 1991). Osredotočanje na ta specifični kontekst poglablja razumevanje okvirja JD-R in zagotavlja dodatno podporo modelu. Ta

model raziskuje dobro počutje delavcev skozi ravnovesje pozitivnih in negativnih značilnosti delovnih nalog (Schaufeli in Taris 2014).

V celoti ta disertacija (1) identificira dejavnike in teme vlog delavcev prve linije v MSP, (2) določa delovne zahteve in vire za delavce prve linije v kontekstu vitkih MSP, (3) sklepa o izidih za delavce v vitkih MSP, na podlagi modela JD-R, (4) obravnava vpliv uporabe vitkosti v MSP na dobro počutje delavcev prve linije, (5) potrjuje uporabnost modela JD-R v vitkem kontekstu v MSP in nadgrajuje model glede na značilnosti vitkih MSP ter (6) zagotavlja razumevanje mehanizmov za delovno angažiranost, izčrpanost in delovno uspešnost delavcev prve linije v vitkih MSP.

Raziskovalna metodologija

Disertacija, obsežna študija, sestavljena iz treh glavnih poglavij, zagotavlja poglobljeno raziskavo teme. V prvem poglavju pregled literature ponuja celovit pregled vloge delavcev prve linije v vitkih MSP, pri čemer opredeljuje teme in dejavnike, ki zadevajo vloge delavcev prve linije v vitkih MSP, ter oblikuje okvir njihovih vlog v vitkih MSP. Drugo poglavje se podrobneje posveti izidom za delavce prve linije prek kvalitativne študije, razširja ugotovitve identificiranih značilnosti delovnih nalog skozi intervjuje z managerji in delavci prve linije v vitkih MSP. Tretje poglavje pa rigorozno testira vpliv izbranih značilnosti delovnih nalog na izčrpanost, delovno angažiranost in delovno uspešnost delavcev prve linije skozi model JD-R.

Glavne ugotovitve raziskave

V prvem poglavju predstavljamo obsežen povzetek vlog delavcev prve linije (FLE) pri implementaciji vitkosti v MSP. Identificiramo glavne teme in dejavnike, povezane z vlogo delavcev prve linije pri izvajanju vitkosti v MSP, ter določimo pripadajoče dejavnike, ki omogočajo ali ovirajo vitko prakso in lahko managerjem v MSP pomagajo pri sprejemanju vitkosti ter povečajo verjetnost uspešne implementacije. Teme in njihovi osnovni dejavniki so določeni s pomočjo temeljite vsebinske analize, ki je vključevala sistematičen pregled obstoječe literature in kvalitativne intervjuje z managerji ter delavci prve linije v vitkih MSP. Štiri glavne teme, ki predstavljajo vlogo delavcev prve linije v vitkih MSP, vključujejo dejavnike kulturnih sprememb, značilnosti zaposlenih (kompetence in osebnostne lastnosti), vpletenost managementa ter zasnovo vitke delovne naloge. Vsaka od teh vsebuje dejavnike, ki bodisi ovirajo ali spodbujajo vloge delavcev prve linije. Cilj je bolje razumeti vloge delavcev prve linije pri implementaciji vitkosti v MSP in nasloviti operativne koristi, ki presegajo zgolj izboljšanje učinkovitosti.

Po določitvi najpomembnejših tem in dejavnikov, povezanih z vlogami delavcev prve linije v vitkih MSP, se v drugem poglavju osredotočamo na identificiranje delovnih zahtev in virov, specifičnih za delavce prve linije v kontekstu vitkih MSP. V tem poglavju kvalitativno raziskujemo delovne zahteve, s katerimi se srečujejo delavci v vitkih MSP, osvetljujemo delovne vire, ki jih pridobijo za olajšanje delovnega stresa, ter raziskujemo možne delavske

rezultate, ki izhajajo iz identificiranih delovnih zahtev in virov, zlasti izčrpanost in delovno angažiranost. Z akademskega vidika prilagajamo model JD-R okolju vitkih MSP, nadgrajujemo model in ga prilagajamo temu kontekstu. S kvalitativnim pristopom intervjujev z managerji in delavci prve linije v vitkih MSP preverjamo delovne zahteve in vire, ki smo jih identificirali skozi pregled literature, in jih umeščamo v kontekst vitkih MSP (Cullinane et al. 2013). To poglavje razširja teoretične ugotovitve prvega poglavja o vlogi delavcev prve linije v vitkih MSP ter raziskuje in prikazuje izide za delavce.

Poleg tega drugo poglavje osvetljuje pomen vključevanja delavcev prve linije v vitko filozofijo MSP. Kvalitativno raziskujemo, katere značilnosti delovnih nalog v vitkih MSP oblikujejo vedenje in dobro počutje zaposlenih. S pomočjo intervjujev v treh vitkih MSP primerih podjetij smo ugotovili, da so prepoznanje in nagrajevanje, dobra organizacija dela in delovno okolje, podpora sodelavcev in nadrejenih ter komunikacija ključni delovni viri. Pojavljajo se zahtevne delovne naloge, ki vključujejo reševanje problemov, spremembe miselnosti delavcev prve linije in izzive v proizvodnji. Zaviralne delovne zahteve v vitkih MSP za delavce prve linije vključujejo pomanjkanje zavedanja o vitkosti in razumevanja med delavci prve linije ter ignoriranje vodstva glede vloge in potencialnega prispevka delavcev prve linije. Te značilnosti delovnih nalog se pojavljajo v vseh primerih, ne glede na vrsto proizvodnje ali druge spremenljivke.

Tretje poglavje se poglablja v razumevanje izidov za delavce v vitkih MSP skozi kvantitativno analizo izbranih ugotovitev iz drugega poglavja. Preučujemo ustreznost modela JD-R za razumevanje odnosa med vitko zasnovo delovnih nalog in rezultati zaposlenih. Okvir JD-R predlaga neposredne povezave med zasnovo delovnih nalog in izidi delavcev, kar potrjujemo v kontekstu delavcev prve linije v vitkih MSP.

Model in rezultati prinašajo pomembne implikacije za delavske rezultate pri delavcih prve linije v vitkih MSP. Rezultati kažejo na delovne značilnosti, ki ustvarjajo pozitivno delovno okolje, povečujejo angažiranost, izčrpavajo energijo in izčrpavajo delavce. Kot je bilo pričakovano, komunikacija izboljšuje delovno angažiranost in kulturne spremembe v organizaciji, medtem ko pomanjkanje virov in reševanje problemov izčrpavata delavce. Povečani motivacijski rezultati pozitivno vplivajo na delovno uspešnost, medtem ko ni očitne povezave med zdravju škodljivimi rezultati (izčrpanostjo) in delovno uspešnostjo. Presenetljivo je, da reševanje problemov ne povečuje delovne angažiranosti in ne zmanjšuje izčrpanosti. Namesto tega se zdi, da ga delavci dojemajo podobno kot druge delovne zahteve, kar pomeni, da se obravnava kot zaviralna delovna zahteva.

Znanstveni in managerski prispevek

Ugotovitve te disertacije poudarjajo edinstvene vidike implementacije vitkosti v MSP, ki so hkrati zelo prilagodljivi in zahtevni. Naša raziskava, skladna s predhodnimi študijami, kaže na motivacijsko vlogo vitkih delovnih virov in na zdravju škodljivo vlogo vitkih delovnih zahtev (Conti et al., 2006; Cullinane et al., 2013; Jackson & Mullarkey, 2000). Ta študija je

prva, ki specifično obravnava delavce prve linije in raziskuje razlike v zasnovi delovnih nalog v vitkih MSP glede delovnih virov in zahtev, kar omogoča napovedovanje izidov za delavce. Ugotovili smo, da specifične delovne zahteve v vitkih MSP izčrpavajo energijo delavci prve linije, vendar ne služijo kot motivacijski izzivi, ki bi napovedovali delovno angažiranost. Tu se naša študija razlikuje od drugih raziskav, ki trdijo, da nekatere delovne zahteve sicer predstavljajo izziv, vendar lahko delujejo tudi kot motivacijski izzivi, ki napovedujejo delovno angažiranost (Cullinane et al. 2013). Naše hipoteze potrjujejo predhodne raziskave, saj ugotavljajo tako pozitivne kot negativne izide za zaposlene pri izvajanju vitkosti (Anderson-Connolly et al., 2002; Conti et al., 2006; Cullinane et al., 2013; Godard, 2004; Jackson & Mullarkey, 2000; Seppälä & Klemola, 2004).

Metodološke omejitve in priporočila za nadaljnje raziskave

V posameznih poglavjih so bile omejitve, odvisne od uporabljene metodologije. V prvem poglavju, kjer smo izvedli pregled literature, je lahko prišlo do subjektivnosti pri kodirnih odločitvah. V drugem poglavju kvalitativna analiza omejuje raziskavo na proizvodno industrijo, saj je bilo zaradi narave teme in neobstoječe baze podatkov o vitkih podjetjih izvedeno namensko vzorčenje. Poleg tega analiza kvalitativnih podatkov vključuje induktivno sklepanje – odkrivanje vzorcev, tem in kategorij, ki so lahko odvisni od raziskovalčeve perspektive in znanja.

Glavna omejitev te študije je časovna omejitev, ki ne omogoča longitudinalne raziskave zasnove delovnih nalog in izidov za delavce v vitkih MSP. Longitudinalna študija je priporočena za nadaljnje raziskave na to temo. Poleg tega je, kot je običajno pri študijah primera, mogoče, da smo z izbiro specifičnih podjetij izpustili nekatere delovne zahteve ali vire, ki so uporabljeni v drugih vitkih MSP in lahko vplivajo na uspešnost, angažiranost in izčrpanost delavcev. Ker imamo samo nekaj sodelujočih MSP, ne moremo oblikovati splošnih sklepov za vsa vitka MSP.

Nadaljnje raziskave, ki bi preučevale odnos med managementom in delavci prve linije ter razlike v njihovih pričakovanjih in pogledih na vitkost, bi lahko pomembno prispevale k uspešnejši implementaciji vitkosti v MSP. Ta še neraziskano področje ima potencial za revolucionaren vpogled v uporabo vitkosti v MSP. Medtem ko se pogosto verjame, da je razdalja med managementom in delavci prve linije v MSP manjša, se zdi, da MSP te bližine ne izkoriščajo v celoti za izboljšanje uporabe vitkosti v podjetju. Zato so priporočljive nadaljnje raziskave za iskanje boljših načinov razumevanja med managementom in delavci prve linije.

Spremenljivke, kot so odnos, motivacija, usposabljanje, izobrazba, znanja in strokovnost delavcev prve linije, se lahko razlikujejo glede na regijo, v kateri je raziskava izvedena (Qureshi et al., 2022). Na primer, v naši raziskavi, ki smo jo izvedli v hrvaških in slovenskih vitkih MSP, smo opazili določene regionalne razlike, ki so vplivale na te spremenljivke. Zato je treba biti pri interpretaciji naših ugotovitev pozoren na nacionalni kontekst. Druge

raziskovalce pozivamo, naj potrdijo naše ugotovitve v drugih nacionalnih kontekstih in raziskujejo specifične regionalne dejavnike, ki lahko vplivajo na spremenljivke delavcev prve linije v vitkih MSP.

Glede na različne faze implementacije vitkosti, kot so različne stopnje uporabe vitkosti v različnih fazah, tip industrije in stopnja vključenosti zaposlenih, pozivamo k dodatnim raziskavam za preučitev dobrobiti delavcev prve linije v različnih primerih vitkosti. To bo zagotovilo bolj celovito razumevanje tematike in lahko vodi k učinkovitejšim strategijam za izboljšanje dobrobiti delavcev prve linije v vitkih MSP.

Zaključimo lahko, da bi morala MSP prepoznati svoje inherentne pomanjkljivosti in jih izkoristiti v svojo korist. Čeprav so majhna in prilagodljiva, lahko delavcem ponudijo več avtonomije in fleksibilnosti namesto standardiziranega dela. Manjša podjetja ne formalizirajo toliko svojih postopkov, kar pomeni, da vitkost tudi ni formalizirana, temveč se izvaja spontano kot skupek orodij. Vendar pa bi morala MSP, da bi v celoti izkoristila prednosti vitkosti, osredotočiti na formalizacijo izboljševalnih rutin, spodbujanje proaktivnosti delavcev prve linije in zagotavljanje njihovega popolnega razumevanja vitkih prizadevanj. Ta formalizacija lahko vodi k boljši delovni uspešnosti in trajnejši vlogi delavcev prve linije, kar bo prineslo novo obdobje vitkega managementa v MSP.

Prilagojeni in prilagojeni model JD-R lahko služi kot diagnostično orodje za razumevanje vpliva zasnove delovnih nalog na izide za delavce ter identificira ravnovesje med delovnimi zahtevami in viri. To bo pomagalo ustvariti vitko zasnovo delovnih nalog v MSP, ki koristi organizacijam in delavcem prve linije. Z uporabo predstavljenega okvira lahko management pregleda vplive delovnih virov in zahtev v vitkih MSP ter jih organizira posebej glede na delavce prve linije. Ugotovili smo, da je komunikacija dragocen delovni vir za delavce prve linije, ki spodbuja njihovo delovno angažiranost v vitkih MSP. Po drugi strani pa reševanje problemov, organizacijske kulturne spremembe in omejena razpoložljivost virov ogrožajo dobro počutje delavcev in jih izčrpavajo. Delavci prve linije imajo običajno zahtevno, nadzorovano delo, ki verjetno ogroža njihovo zdravje, in to tveganje je treba zmanjšati, da bodo vloge delavcev prve linije bolj trajnostne in bodo vodile k višji delovni uspešnosti.

Ugotovitve te disertacije nam omogočajo predlaganje nadaljnjega razvoja obstoječe teorije o modelu JD-R, ki izhaja iz specifičnosti MSP. Naš cilj je bil preizkusiti in potrditi model JD-R v okolju vitkih MSP s poudarkom na delavcih prve linije. Ta študija prikazuje, kako lahko model JD-R služi kot analitično orodje za preučevanje vpliva različnih delovnih zahtev in virov na izčrpanost zaposlenih, delovno angažiranost in končno delovno uspešnost. Na podlagi kvalitativne analize, v kateri smo identificirali specifične delovne zahteve in vire za delavce prve linije v vitkem okolju MSP, smo kvantitativno testirali potencialne dejavnike različnih izidov za delavce (Bakker, Oerlemans in Ten Brummelhuis 2016; Huo in Boxall 2017). Tako lahko managerji pregledajo vpliv delovnih zahtev, ki jih nalagajo delavcem, ter delovnih virov, ki jih zagotavljajo, za izboljšanje delovne uspešnosti delavcev.

Na koncu je dobro počutje delavcev ključni vidik uspeha MSP in MSP morajo postaviti dobro počutje svojih zaposlenih kot prednostno nalogo. Z uvedbo podpornih praks, kot so redne povratne informacije, možnosti usposabljanja in fleksibilni delovni pogoji, ter ustvarjanjem pozitivnega delovnega okolja, ki spodbuja odprto komunikacijo, sodelovanje in priznavanje, lahko MSP izboljšajo dobro počutje delavcev. Te prakse in okolja lahko privedejo do povečanja zadovoljstva pri delu, motivacije in produktivnosti med delavci prve linije. Čeprav ni vnaprej določenega izida za dobro počutje delavcev prve linije v vitkih MSP, je vpliv na dobro počutje odvisen od ocene tveganj pri vitkih delovnih zahtevah in od tega, kako so vitki delovni viri MSP mobilizirani za njihovo obravnavo. Glavna ideja raziskave je najti ravnovesje med delovnimi zahtevami in delovnimi viri za oblikovanje vitke zasnove delovnih nalog v MSP, ki koristi tako organizaciji kot njenim zaposlenim. S svojo raziskavo smo dokazali, da je v MSP, kljub njihovim težavam, možno oblikovati vitkost tako, da so zaposleni angažirani in motivirani za delo, kar vodi v višjo delovno uspešnost in dolgotrajne pozitivne učinke vitkosti.

Appendix 2: Consent form for interviews

Consent for participation in a scientific project

Project name: Worker outcomes in lean implementation in small and medium-sized enterprises

Researcher: Viktorija Knapić

By signing this declaration of consent, you agree to voluntarily participate in the research project entitled "Worker outcomes in lean implementation in small and medium-sized enterprises" conducted by Viktorija Knapić, PhD student at the Faculty of Economics, University of Ljubljana and teaching and research assistant at the Faculty of Economics, University of Rijeka.

Participation in the research is voluntary, and no monetary compensation is received. Participation can be cancelled at any time. Participation in the research involves an interview with the researcher. The conversation lasts a maximum of 60 minutes, and during that conversation, the researcher can, with the consent of the interviewee, take notes and record, and later make a transcript of the recordings while ensuring the anonymity of the participant.

If the interviewee feels uncomfortable or considers the question inappropriate for any reason, he has the right to refuse to answer.

The researcher will not name the individual in any report, and the data will remain confidential and protected. The subsequent use of the data will be carried out according to the rules that guarantee individual and institutional anonymity. The research and collected data will be used for academic purposes only.

By signing this consent form, you confirm that you have read and understand the terms and conditions and voluntarily agree to participate in this research under the above conditions.

If you have additional questions, feel free to contact us by email at: viktorija.knapic@gmail.com.

Interviewee name and surname:	Name and surname of researcher:
Organisation:	Institution:
Signature:	**Signature:**
Place and date	Place and date

Appendix 3: Research project invitation letter

Rijeka, september 2022.

Participation in a research project

Research on the application of lean manufacturing (lean) in small and medium-sized enterprises, with a special emphasis on employee outcomes, is carried out as part of the doctoral dissertation "Worker outcomes in lean implementation in small and medium-sized enterprises." The purpose of this research is to guide how to make a lean work environment productive and efficient while maintaining a high level of employee well-being by identifying the stressors and motivators behind their work roles.

The first part of the research includes conducting interviews with lean managers and employees of lean small and medium enterprises. The intention is to interview one lean manager and at least four employees working in the lean system within one company. Participation means answering open questions about the experiences of daily lean work in your company. The interview lasts a maximum of 60 minutes per employee.

Participation in this research is voluntary, and you may choose to withdraw from the research at any time. All information you provide is confidential and will be summarized and evaluated on an aggregate level, combined with other participating businesses. Your company will receive summary results with recommendations for improving the lean environment for greater efficiency and employee satisfaction.

The project will last one year, but the first results are expected by the end of the year. If you wish, we can send you the complete results based on these interviews upon completion. The second part of the research includes implementing a questionnaire on line employees in lean small and medium-sized enterprises, for which we will contact you later. The goal is to design work that enables greater employee satisfaction and thus ensures greater company productivity.

Your participation and insight will improve the understanding of the use of lean in small and medium-sized enterprises and the effect on employees therefore I kindly ask you to participate in the research as a manager and the participation of your employees in conducting the research in the form of interviews and later filling out questionnaires. If you are willing to participate in the research, please get back to me by email so that we can agree on an appointment that suits you best. Also, if you have any research-related questions, please contact me at +385 91 521 6752 or by email at viktorija.knapic@gmail.com.

I thank you in advance for future cooperation.

Viktorija Knapic

Appendix 4: Brief sociodemographic questionnaire

ID number	*e.g. 001*
Age	*Exact number, e.g. 28*
Gender	*M/F*
Organisational tenure	*Time spent in the current organisation, e.g. 3 years*
Experience in current position	*Time worked in this or similar positions, e.g. 6 months*
Experience in lean companies	*Time worked in lean companies in total, e.g. 5 years*
Current work area	*The area you are currently working in*
Education level	*Level of education you attained, e.g. bachelor of engineering*
Type of contract	*Part-time, full-time, temporary worker*

Source: own work.

Appendix 5: Interview participant characteristics

ID	*Gender*	*Age*	*Occupation*	*Company*	*Work experience in lean*	*Interview date (DD/MM/YY)*
*000**	M	26	3rd ship officer	/	1 year	01/05/22
*001**	M	33	Production manager	/	4 years	27/09/22
002	M	38	CEO	A	14 years	27/09/22
003	M	32	Foreman in production	B	4 years	30/09/22
004	M	46	Production manager	B	6 years	30/09/22
005	M	34	Continuous improvement manager	B	6 years	30/09/22
006	M	40	Machine worker	A	21 years	17/10/22
007	M	51	Off-machine preparation worker	A	34 years	18/10/22
008	M	39	Gluing machine assistant worker	A	5 years	21/10/22
009a	M	28	Lean manager	C	5 years	20/10/22
009b	F	37	Production management associate	C	0,5 years	20/10/22
010a	M	22	Manual preparation worker	C	3 years	20/10/22
010b	M	34	Manual preparation worker	C	1,5 years	20/10/22
011a	M	33	Sheet metal machining operator	C	5 years	20/10/22
011b	M	29	Sheet metal machining operator	C	2 years	20/10/22
012a	M	29	Power electronics operator	C	3 years	20/10/22
012b	M	23	Power electronics operator	C	5 years	20/10/22
013a	M	43	Assembly operator	C	5 years	20/10/22
013b	M	26	Assembly operator	C	5 years	20/10/22
014	M	31	Automatic lines operator	B	5 years	02/12/22
015	M	33	Sand preparation operator	B	6 years	02/12/22

*Note: *pilot interviews.*

Source: own work.

Appendix 6: Interview guide and interview questions

Section and brief content	Interview questions and script	Prompt and/or brief section content
Background information Qualifications, working activity	*Participants will receive background data about them prepared before the interviews.* Please confirm the following background information is correct for you. **Name? Age?** **Number of years employed in this company?** **Number of years in lean companies?**	
QUESTIONS FOR EMPLOYEES		
Usual working day - employees	1. **What does a typical working day consist of for you? What are all your responsibilities at work?** ***(What tasks do you perform? How many workstations do you work on, and how often do you rotate between them? work station = an area where work of a particular nature is carried out, such as a specific location on an assembly line)*** Description of a working day and the tasks and tools a worker usually goes through. Hourly description of work tasks. 2. **How do you feel about the tasks you do in relation to lean?** ***(Do you happily go to work, and do you feel your job is stimulating or boring, positive or negative?)*** Describing the emotions that occur about the work they do gives insight into the worker's relationship with the job. 3. **How do you feel at the end of your workday regarding the work that you did?** ***(Why is that?)*** Final emotions after finishing a work day – here, we can discover whether the type of work depletes energy or what kind of effect it has on workers. 4. **What are the good and bad sides of your job?**	Understanding worker role in lean and everyday operations

	Describing work, identifying JD and JR.	
Worker's preconditions and resources - employees	**5. Do you feel you have all the necessary tools to do your job effectively and efficiently?** ***(Could you describe what those tools are? Could you describe a situation where you did not have the necessary tools for the job?)*** Employee opinion on tools that enable them to work. List of these tools. They are possibly describing frustrations if there is a lack of tools necessary for work. 6. **Which aspects of the job are rewarding or beneficial for you?** Describing work parts which are positive, employees feel rewarded or that they are benefiting from them. **7. Which aspects of the job provide the most energy?** ***(What motivates you to do your job?)*** Job aspects which energize workers. **8. How did you learn to work with current lean tools?** ***(education or training provided by the organisation, mentorship, with colleagues)*** If there were some organized learning ways (training, etc.), or worker learns on the job (which may cause a burden). **9. How often do you need to learn new skills regarding lean?** Are the employees expected to develop at work? Are they developing their skills and knowledge regarding lean daily/monthly? **10. Are you able to perform according to a predicted timeline/plan?** ***(Do you usually perform as is expected of you?)*** Are there big demands on workers? Do they have work overload, or are they able to perform according to the predicted timeline/plan? ***11.*** **How do you plan and arrange your work setup?** ***(Can you make decisions on the workstation independently?)*** Do employees have a say in the work they do? Is management open to suggestions? Are the employees autonomous in making work decisions?	Prompt: identifying job resources; training, communication, involvement, health and safety awareness, flexibility, information management, reward and recognition, support

	12. **Describe how much of your work tasks depend on the physical tools you are provided with, as opposed to your abilities as an individual *(level of knowledge, type of character)*.** How does the same work task depend on the level of knowledge or type of character, or is it purely up to the amount of tools at an employee's disposal?	
Challenges for the workers - employees	**13. In what way is your job demanding or challenging? *(Are any aspects of your job that feel physically or mentally demanding? In what ways does the company make sure to alleviate those challenges?)*** Describing challenges in work, identifying JD and potential JR to combat the JD. **14. Are there aspects of your job you feel may be improved, and how?** How do they feel about work? Is there something missing to do the job more effectively? What parts of work are lacking – where do employees face challenges? ***15.*** **What parts of lean make your work strenuous or frustrating? Are there any limitations in your work? *(for example, you have a vision of how something can be done but are limited in doing what you think is best for the job)*** Identify JD. **16. What kind of workstation instructions are available to you? (Do you use them? Why/why not? Could they be improved?)** Visual management prompt. **17. Are there sources of stress at work?** Identify JD **18. Are there distractions or disturbances in your work environment? (e.g. too much noise, vibrations…)** Identify JD **19. Could you describe the "tricks" you use to make work easier? *(How do you bypass standard practices or rules to make your job easier or more manageable?)*** To see what is lacking and how lean employees make up for it. **20. Describe the most recent work issue and how you solved it.**	Prompt: challenge job demands; workload, problem-solving, commitment to improvement, production responsibility, decision-making, multitasking Hindrance job demands; lack of training, financial constraints, inadequate lean expertise, resource constraints, limited worker skills, leadership deficiencies, lack of support, time constraints Potential outcomes stemming from identified JD (Q19)

	Leaning on question 19, to identify JD. **21. How would you say all these challenges you pointed out affect you or your job?** Identify potential outcomes stemming from identified JD.	
Future/the long run - employees	**22. What makes you continue working in this company?** Identify positive aspects and potential JR (eg colleague support). **23. Do you see possible reasons to quit working that are connected to lean? *(in current company and in lean in general)*** Identify JD (too much work, responsibility...). **24. Would you be able to maintain the current work pace and schedule up until retirement?** E.g. opportunities for promotion, work overload...?	Identifying additional job resources (Q20) or job demands (Q21, Q22).
QUESTIONS FOR MANAGEMENT		
Usual working day in lean - management	**1. What lean tools are at employee disposal for everyday work?** Description of various tools employees use (or can use) in their daily activities. **2. How many workstations does one employee work on average, and how often do they rotate between them?** Number of workstations one worker goes through, number of rotations (task switching) a worker goes through in a regular working day. Here we can identify how much workload a worker has, or are they expected to be multiskilled or work on one station (limited skills). **3. In what ways does management care for the employee's well-being at his workplace (safety, mental and physical health)?** Identify JR from the management perspective.	Prompt: management perspective on employee work in lean
Worker's preconditions and resources - management	**4. What kind of support do employees receive for performing at their work position in the lean context?**	Prompt: job resources

	Do employees receive training to perform effectively? Does management hold meetings? How do they ensure employees get everything they need to perform at their jobs? 5. **Do employees undergo training for lean programmes? In what form? If not, what are the alternatives to learning to work with lean tools?** Similar to e), how do employees learn to work in lean (prompt for discovering resources) 6. **In what way do employees offer suggestions for improvements? How are they encouraged to make suggestions?** Are they allowed or required to offer suggestions? Is it connected to problem-solving and autonomy? 7. **Describe your relationship with employees. *(How often do you communicate? Can employees offer suggestions directly to you?)*** Relationship worker-manager to discover the type of organisational culture and whether there is management support. 8. **How much control do the employees have over the variety of methods they can use to complete their work and over the quality of their work?** Do workers have autonomy, responsibility... 9. **What do you expect from workers in their positions *(simply doing the job, taking initiative...)*?** In the sense of taking the initiative, doing repetitive tasks...	
Challenges for the workers - management	10. **What stressors are affecting your team members? What about motivators?** Identify JR. 11. **In which areas do you find lean lacking, connected to your employees and their work?** Where can lean use improve, and what is missing to make employees work better? 12. **In what way do you think the size of a lean company affects the work of employees and their well-being?**	Prompt: job demands

	Identifying the specifics of SMEs.	
Wrap-up	*The participant will receive a brief questionnaire to fill out about socio-demographic information.* We've come to the end of the interview. **Are there any questions you would like to ask, or would you like to add something?** In that case, I would like to ask you to fill out this brief questionnaire with your socio-demographic information. Thank you, with this we conclude our interview. We want to thank you for participating in this research and sharing your experience. It was a pleasure meeting you. To remind you, we will transcribe this interview and anonymize the information you provided. All the material is confidential. When the project finishes, your company will receive aggregate results from the interviews. If you have any additional questions or want to add something you remember subsequently, feel free to contact me (*provide contact information*).	Obtaining socio-demographic information, concluding the interview,

Note: the focal point of the interview is marked yellow for employees and green for managers/lean supervisors.

Source: own work with parts adjusted from (Wollter Bergman et al., 2021) and (Mojtahedzadeh et al., 2021).

Appendix 7: Questionnaire design with constructs, sources and items

JD or JR	Construct	Source and scale	Item	Parcel
JOB RESOURCES	good work organisation	(Eklöf et al., 2010) – reversed from organisational governance deficiencies	I have to use informal channels to get resources for my work.	GWO -A
			I have difficulty getting a clear picture of what I am responsible for.	GWO-B
			I have difficulty overviewing the decision-making processes in the organisation.	GWO-B
			I have to adapt to tightly controlled requirements for uniformity.	GWO-C
			Other units compete with my own for personnel and other resources.	GWO-C
			The decisions made higher up in the organisation are very difficult or impossible to implement in my work.	GWO-A
	communication / information management	(Spasojevic Brkic & Tomic, 2016) - communication	In our organisation, communication channels are always open, and information is always available.	COMM-A
			In our organisation, it is easy to obtain or get certain information.	COMM-B
			In our organisation, communication promotes motivation by informing the employees.	COMM-B
			In our organisation, communication also plays a crucial role in altering employees' attitudes.	COMM-C
			In our organisation, there is formal and informal communication. Both are extremly important.	COMM-C

HINDRANCE JOB DEMANDS	organisational cultural change	(Ramadas & Satish, 2018) – culture and resistance to change	I face fear of failure in my company.	OCC-A
			The reasons for change to lean in my company are unclear to me.	OCC-A
			I experienced loss of status after lean implementation.	OCC-A
			My routine was broken after lean was introduced to the company.	OCC-A
			I have a fear of financial loss in my company.	OCC-B
			I have a fear about changes requiring skill.	OCC-B
			I don't see the benefits and rewards of lean implementation in my company.	OCC-B
			I have a fear of losing my job.	OCC-C
			I have a fear of adding more responsibility to my job.	OCC-C
	lack of resources	(Schaufeli, 2015) (Hochwarter et al., 2008) – reversed from perceived resources	I have all the tools (tools, equipment, instruments, software) needed to do my job properly.	LOR-A
			When work is stressful, I am able to conserve my energy.	LOR-A
			I have enough equipment and personnel at my disposal to fill in for me at work.	LOR-B
			When I feel like my battery is run down at work, I can get others to pick up some of the load.	LOR-B
			When work gets overwhelming, I am able to get away long enough to regain my strength.	LOR-C
			I am able to pace myself at work when things get hectic.	LOR-C
			I can change my behavior at work to make sure that I don't run on an empty tank.	LOR-C
CHALLENGE JOB DEMANDS	problem-solving	(Wall et al., 1995)	I am required to deal with problems which are difficult to solve.	ProbSol-A
			I have to solve problems which have no obvious correct answer.	ProbSol-B

			I need to use my knowledge of the production process to help prevent problems arising in my job.	ProbSol-B
			The problems I deal with require a thorough knowledge of the production process in my area.	ProbSol-C
			I come across problems in my job I have not met before.	ProbSol-C
WORK ENGAGEMENT	vigour	(Salanova et al., 2005)	At work, I feel full of energy.	ENG-A
			In my job, I feel strong and vigorous.	ENG-A
			When I get up in the morning, I feel like going to work.	ENG-A
	dedication		I am enthusiastic about my job.	ENG-B
			My job inspires me.	ENG-B
			I am proud of the work I do.	ENG-C
EXHAUSTION		(Huo & Boxall, 2018; Hu & Schaufeli, 2011)	There are days when I feel tired before I arrive at work.	EXH-A
			After work, I tend to need more time than in the past in order to relax and feel better.	EXH-A
			During my work, I often feel emotionally drained.	EXH-B
			After my work, I usually feel worn out and weary.	EXH-C
JOB PERFORMANCE		(Ramos-Villagrasa et al., 2019)	I manage to plan my work so that I finish it on time.	JP-A
			I keep in mind the work result I need to achieve.	JP-A
			I am able to set priorities.	JP-B
			I am able to carry out my work efficiently.	JP-B
			I manage my time well.	JP-C

Note: Items colored blue are reversed. Red words signify changes made to the original scale.

Source: own work.

Appendix 8: Sample descriptive statistics for questionnaire analysis

Company	Number of questionnaires	Average age (in years)	Average tenure (in years)	Education level	Gender
A	71	42,5	13,3	E: 19,1% HS: 79,4% UNI: 1,5%	M: 87% F: 13%
B	25	39,5	6,4	E: 4% HS: 96%	M: 80% F: 20%
C	89	40,1	7,5	E: 8% HS: 92%	M: 57% F: 43%
D	44	32	5,8	E: 2% HS: 95% UNI: 3%	M: 98% F: 2%
E	12	37,6	7,4	HS: 100%	M: 100%
F	26	47,1	12,8	HS: 77,8% UNI: 22,2%	M: 19% F: 81%
G	6	32,3	4	E: 16,7% HS: 50% UNI: 33,3%	M: 100%
TOTAL	273 questionnaires	38,7 years	8,2 years	HS: 88%	M: 77%

Note: E – elementary education, HS – high school, UNI – university degree, M – male, F – female

Source: own work