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ORGANIZACIJA

Organizacija (Journal of Management, Informatics and Human Resources) is an interdisciplinary peer-reviewed journal which is open to contributions of high quality, from any perspective relevant to the organizational phenomena.

The journal is designed to encourage interest in all matters relating to organizational sciences and is intended to appeal to both the academic and professional community. In particular, journal publishes original articles that advance the empirical, theoretical, and methodological understanding of the theories and concepts of management and organization. The journal welcomes contributions from other scientific disciplines that encourage new conceptualizations in organizational theory and management practice.

We welcome different perspectives of analysis, including the organizations of various sizes and from various branches, units that constitute organizations, and the networks in which organizations are embedded.

Topics are drawn, but not limited to the following areas:

- organizational theory, management, development, and organizational behaviour;
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- papers that analyse and seek to improve organizational performance.

Organizacija (Revija za management, informatiko in človeške vire) je interdisciplinarna recenzirana revija, ki objavlja visoko kakovostne prispevke z vseh vidikov, ki so pomembni za organizacijske procese in strukture.

Revija je zasnovana tako, da spodbuja zanimanje za različne vidike v zvezi z organizacijskimi vedami in je namenjena tako akademski kot strokovni skupnosti. Revija objavlja izvirne članke, ki spodbujajo empirično, teoretično in metodološko razumevanje teorij in konceptov managementa in organizacije. Pozdravljamo tudi prispevke iz drugih znanstvenih disciplin, ki spodbujajo nove koncepte v organizacijski teoriji in praksi. Objavljamo članke, ki analizirajo organiziranost z različnih vidikov, so usmerjeni na organizacije različnih velikosti in iz različnih sektorjev, na enote, ki sestavljajo organizacije, in na mreže, v katere so organizacije vpete.

Teme so pokrivajo predvsem naslednja področja:

- organizacijska teorija, upravljanje, razvoj in organizacijsko vedenje;
- management človeških virov (kot so organizacija in razvoj zaposlenih, vodenje, ustvarjanje vrednosti s pomočjo človeških virov, organizacijski pojavi na delovnem mestu itd.);
- vodstveni in podjetniški vidiki izobraževanja;
- poslovni informacijski sistemi (kot so digitalno poslovanje, sistemi za podporo odločanju, poslovna analitika itd.);
- podjetniški inženiring (npr. organizacijsko oblikovanje, upravljanje poslovnih procesov, paradigme preoblikovanja podjetij itd.);
- članki, ki analizirajo organizacijsko uspešnost in prizadevanja za izboljšanje le-te.

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From Digital Divide to Technostress during the COVID-19 Pandemic: A Scoping Review

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Background and purpose: This paper relates challenges faced by older adult employees during the COVID-19 crisis in order to describe strategies to reduce the digital divide and technostress, thereby supporting inclusion and retention in the marketplace. Older adults are particularly at risk of Internet-related social exclusion, especially during the COVID-19 pandemic. The main research question of the current scoping review were: What kind of strategies can reduce the digital divide and technostress of older adult employees and contribute to their inclusion and retention in the working market during the COVID-19 pandemic?
Methodology: This review is based on the Arksey and O'Malley framework for scoping reviews. The six-stage framework includes: identifying research questions, identifying relevant studies, study selection, charting the data, summarizing and reporting the results, and a consultation exercise. A scoping review was conducted using five humanistic and social electronic databases - CINAHL with full text, EBSCO, Medline, SocIndex, Web of Science - and additionally hand-searches performed on Google Scholar. The search was limited to studies published from January 2020 to March 2021. After applying inclusion and exclusion criteria, 10 articles were included.
Results: This review shows that the most important strategies are: 1) ICT educational training courses; 2) social dialog; 3) building inclusive workplaces; 4) implementation of successful 'aging in public' policies. Our results are beneficial for individuals, organizations, industries and different societies by showing how concrete strategies can be implemented at multiple levels.
Conclusion: The study has found that one of the most effective strategies to reduce the digital divide faced by older adult employees during the COVID-19 crisis and technostress is social dialog between employers and employees, which can be a source of innovative and creative solutions (e.g. partnership programs or tailored support). Social dialog should include active cooperation with older adult workers - asking what they need and want - to enable skills development through training.

Keywords: COVID-19, Digital divide, Older adult, Employees, Technostress

1 Introduction

The COVID-19 pandemic turned the world of work upside down and is having a dramatic effect on the livelihoods and well-being of workers, their families, and businesses worldwide - particularly small and medium-sized enterprises (Kumar et al., 2021). Employees are required to distance themselves physically and socially, and public and private entities responded to this obligation by transferring their activities to cyberspace. According to Mazzucato & Kattel, (2020), COVID-19 brought to the fore long-

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held concerns regarding the digital economy: the lack of privacy and monopoly power of Big Tech, incapability of governments, and the digital divide between those with and without access. As a consequence, the digital skills of older adult employees around the world have been subjected to daily trials during the COVID 19 pandemic. Older adults are the fastest growing segment of the population, and the definition of "older person" varies from country to country. In this article we have adopted 60+ as a working age-category, consistent with the United Nations definition (2017) of older adults; however, this is not to convey that older adults are a homogenous group defined by a specific age, nor to challenge age as a fluid concept.

Technology use among older adults increased in tandem with the trends of increasing technology use in the general population (OECD, 2017). Older adults are particularly at risk of internet-related social exclusion, since they tend to use the Internet less than younger adults. Additionally, older adults use ICT the least and very often require educational support to be included in the information society (Seifert et al, 2018). According to Gell et al. (2015), older adults are on average less technology-literate than younger adults, adding to feelings of marginalization (Watson, 2018). Passarelli et al. (2016) defined digital exclusion as people at risk of being excluded from access and use of digital technologies. Schejter et. al. (2015) explained digital exclusion involves the unequal access and unequal capacity to use information and communication technologies (ICTs) that are seen as essential to fully participate in society. Van Dijk (2005) identifies a sequential relationship between social inequalities and unequal access to digital technologies. The definition of digital exclusion has changed in recent literature; positions based on a simple 'user/non-user' and internet 'have/have not' understanding have shifted to an exploration of the gradations of internet use and a 'skills divide' (Van Dijk, 2012). There is a relationship between digital exclusion and technostress, with technostress being both a cause and a consequence of digital exclusion. For example, older workers have adequate intellectual capacity, but are concerned about the use of ICT due to various previous events (e.g., failure to learn new software). This factor can block them and prevent them from entering the lifelong learning process. On the other hand, technostress may be a natural element when learning to use new hardware and software. Thus, it can be both an effect and a cause of digital exclusion. Maceviciute & Wilson (2018) described the levels of digital divide based on Van Dijk (2012) as follows: the first level of the digital divide includes physical and material access; the second level of digital divide consists of inequalities in a wide range of "digital skills" (Van Dijk, 2012, p. 67); and the highest, third level of the divide, relates to technology appropriation and use that can be measured in time and frequency, diversity and quality of used applications, and the benefits derived from the usage of technology.

Watson (2018) analyzes the exclusion and marginalization of older people with respect to technology and states that marginalization is a long-lasting and pervasive fact of society, although the use of technology can make older adults feel less marginalized by connecting them socially, such as through communication technologies. The digital divide is a noticeable and global problem presenting the inequality of access to, and use of, Information and Communication Technologies (ICT) between individuals, organizations, regions, and countries (Tomczyk et al., 2020). The challenges connected with the digital divide have become one of the types of social exclusion leading to new social divisions and stratification, economic diversification, loss of privacy, and information and computer crimes (Ziemba, 2019). Harris et al. (2021) explained that ICT users have been found to experience stress associated with their usage of ICT, recently termed 'technostress'. Technostress has been defined as the mental stress that employees experience from using ICT during their work; it is thought to be "caused by an inability to cope with the demands of organizational computer usage" (Tarafdar et al., 2010). The central role of human resources (HR) is driving operational and strategic success during the COVID-19 pandemic; for this role to be successful there is a need to expand understanding of the way work context influences employee behaviors and actions (Collings et al., 2021).

Therefore, this scoping review focuses on how the digital divide and technostress can be reduced and which strategies would contribute to inclusion and retention in the working market during the COVID-19 pandemic, to clarify present knowledge and identify further research. The aim of this scoping review is to relate challenges faced by older adult employees during the COVID-19 crisis in order to describe effective strategies to reduce digital divide and technostress, thereby supporting inclusion and retention in the working market. This review was guided by the following two sub-research questions:

'What kind of strategies can reduce the digital divide and technostress of older adult employees?'

'How can employers contribute to older employees' inclusion and retention in the working market during the COVID-19 pandemic?'

2 Methods and materials

Given that the research questions were exploratory in nature, a scoping review methodology was employed in line with Arksey, O'Malley, (2005), with the recommendations made by Levac et al. (2010). A scoping review is a type of systematic review and a useful methodology for providing actionable and relevant evidence efficiently when time or cost factors are important; it is used to clarify definitions and understand the conceptual boundaries of a research area (Peters et al., 2015, and Tricco et al., 2016).

The audit was carried out in accordance with the PRISMA[1] protocol, which sets minimum criteria for systematic reviews of high-quality scientific publications and increases the transparency of information (Moher et al., 2016).

The review included the five key phases of recommendations made by Arksey, O'Malley (2005) and Tricco et al. (2016): (1) identifying the research question; (2) identifying relevant studies; (3) study selection; (4) charting the data; and (5) collating, summarizing, and reporting the results; the optional 'consultation exercise' of the framework was not conducted. Moreover, as suggested by Levac et al. (2010), this review: a) used an interactive team approach to selecting and extracting studies; b) incorporated an essential numerical summary and a qualitative analysis of the contributions extracted; and c) identified the implication of the study findings for policy and practice. The inclusion and exclusion criteria were specified and documented, as described below.

2.1 Inclusion and exclusion criteria

Articles had to meet the following criteria to be included: be published research studies in academic journals, primarily focused on older adults as workers during the COVID-19 pandemic; the studies had to have taken place in a digital setting; the studies were written in the authors' languages - Arabic, Czech, Danish, English, German, Norwegian, Slovak, and Swedish; and, the peer-reviewed articles were published between January 2020 and March 2021.

Articles which only provided therapy for COVID-19, monographs, book chapters, research reports or meeting abstracts, letters to editors and data papers and duplications were excluded, in addition to articles making no mention of access telecommunications infrastructure or digital divide by older adults during the COVID-19 pandemic.

2.2 Search strategy

Our research team was composed of the three reviewers that signed this work. Through online meetings the team defined the broad research question to be addressed and the study protocol, including the identification of the search terms, databases to be searched, the inclusion and exclusion criteria and the methods to solve any disagreement among the reviewers.

In April 2021, an exhaustive search was carried out following a three-step strategy. Firstly, a systematic search process was conducted using five electronic databases: - CINAHL with full text, EBSCO, Medline, SocIndex, Web of Science - and hand-searches performed on Google Scholar. The search was limited to studies published from January 2020 to March 2021, ensuring the studies were relevant and up to date. The key search terms were developed through an iterative process as the reviewers became more familiar with the evidence base. Subject terms used in this search included combinations of 'covid*', 'new coronavirus', 'pandemic', 'sars-cov2', '2019-ncov', '2019 novel', 'coronavirus disease', 'young seniors', 'older adults employees', 'employment and workplac*', 'older adults workers', 'digital divide', 'access information technology', 'information communication technology',' 'ability to use the internet' 'access telecommunicat*' 'digital infrastructure*' 'digital literacy', 'digital exclusion', 'telework', 'digital work' and 'digital gap'. This initial search was proceeded by an analysis of the title, abstract and index terms of the retrieved papers. Secondly, an additional search using the finalized search terms was performed across all databases. Thirdly, hand-searching was conducted to identify studies not located in the main searches (Hopewell et al, 2007). This involved reviewing the reference lists from the screened studies.

The literature search was conducted separately by three of the authors of this review (A.S, M.M.N, M.T). The first author (A.S.) used two electronic databases: Web of Science core collection (restricted to Social Sciences areas) and EBSCO database (specifically, Psychological and Behavioral Sciences Collection). The other two authors (M.M.N., M.T.) conducted the search in three electronic databases: CINAHL with full text, Medline and SocIndex. All the authors performed hand-searches using Google Scholar.

2.3 Search Outcome

A Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Moher et al. 2015) statement flowchart (Figure 1) was constructed to clearly outline how the included studies were selected. An evidence examination based on the title and abstract was performed for the selection of the studies (Moher et al., 2016). The first search into title, abstract and keywords resulted in 180 documents. Screening identified 92 papers, of which 64 were excluded because they did not meet the objective of the study from the perspective of the social sciences - 30 documents because of duplicates, and 34 that eluded the aim of our study. Additionally, 17 studies as a full text were excluded because the papers were not primarily focused on older adult employees or did not take place in a digital setting. Ultimately, 10 documents were selected for the scoping review. All the selected articles are written in English language, because the English is currently becoming the global "lingua franca" in research. Prior to finalizing which studies were included, 10 full-text papers were selected at random by three independent raters and

[1] PRISMA: see http://www.prisma-statement.org/

assessed for inclusion eligibility, according to the criteria. These raters were all authors of this paper. The independent raters coded the list of studies into three categories: relevant, uncertain, and irrelevant. When differences arose, resolution occurred through examination of the full text and a discussion between the three reviewers, until agreement was found. There was 96% agreement regarding the rating of relevance.

3 Results

The findings of the scoping review process are presented here. The purpose of this review was relating to challenges faced by older adult employees during the COVID-19 crisis. Below we will discuss these findings briefly.

Two of the studies used research methodology with different types of review, and two described a theoretical framework; two studies used mixed methods, two studies had qualitative methods and the final two used quantitative methods. All 10 articles included different parts of the world (Spain, Sweden, Poland, Israel, Korea and one collaboration between Australia & China). Two articles were from the USA and from the UK. Key information from the 10 articles is presented in Table 1.

4 Discussion

The aim of this systematic review was to examine the current state of knowledge and trends in the peer-reviewed literature. We abstracted four main categories of what kind of strategies can reduce the digital divide and technostress of older adult employees and contribute to their inclusion and retention in the working market during the COVID-19 pandemic. They are as follows:

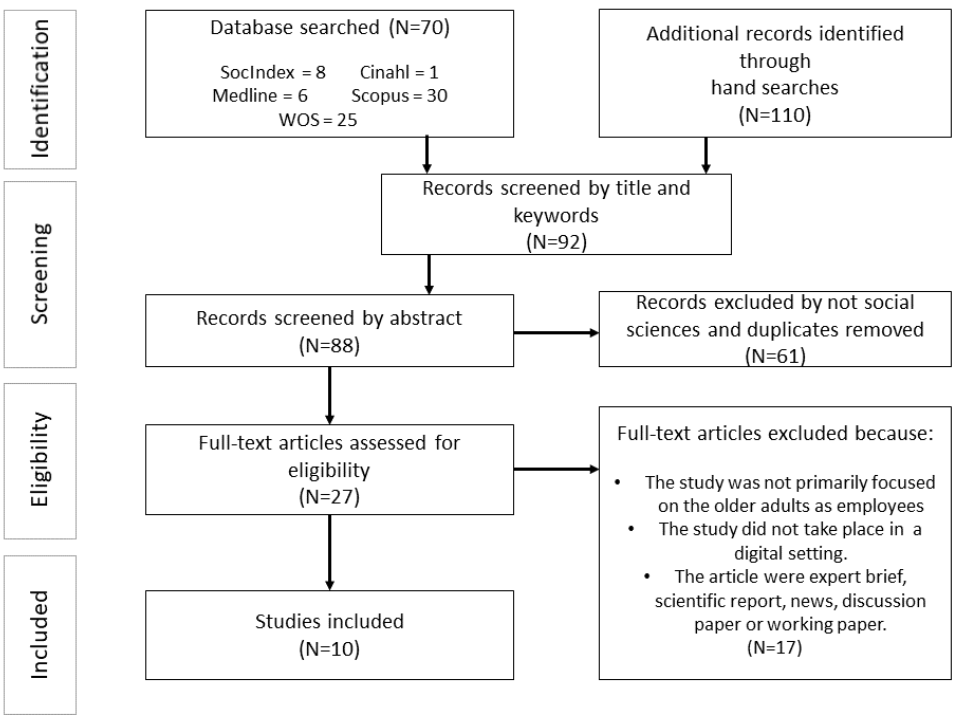

Figure 1: Flowdiagram

Table 1: Summary of studies included

	Source and Country	Study Type	Aims/Purpose	Findings	Recommendation for future research
1.	Monahan et al. (2020). COVID-19 and Ageism: How Positive and Negative Responses Impact Older Adults and Society USA	A theoretical study	This article explores positive and negative responses toward older adults during the COVID-19 pandemic and the expected short- and long-term consequences, such as impacting beliefs about and treatment of older adults, intergenerational relations, and individuals' mental and physical health.	Ageism during the pandemic negatively affects older adults' mental health as they face being devalued, viewed as a burden, and discriminated against. Ultimately, ageism influences how all age groups view their own ageing and older adults, how and whether they positively interact with older adults, and their career choices such as entering the geriatric workforce.	Older adults are vital, valuable contributors to society. Now is the time for research to detail the short and long-term consequences of positive and negative responses toward older adults during the pandemic and take swift policy action.
2.	Mazzucato, M. & Kattel, R. (2020). COVID-19 and public sector capacity UK	A theoretical study	The paper argues that to govern during a pandemic, governments require dynamic capabilities and capacity - which are too often missing. These include the capacity to adapt and learn; align public services and citizen needs; govern resilient production systems; and govern data and digital platforms.	The focus is on an international level, approached in a challenge-oriented or mission-oriented way. This approach could facilitate better coordination mechanisms that accelerate mutual learning and skills transfer. Such a framework could also encourage a higher level of coordination and cooperation between governments and encourage new investment in effective transnational governance mechanisms.	The research should focus on developing the dynamic capabilities of the public sector.

Table 1: Summary of studies included (continues)

3.	Esteban-Navarro et al. (2020). The Rural Digital Divide in the Face of the COVID-19 Pandemic in Europe -Recommendations from a Scoping Review Spain	A scoping review	This article identifies and analyzes the proposals made by academic literature to overcome the digital divide in the European rural world for the five-year period 2016–2020.	Three lines of action are proposed: the evaluation of national and regional public policies; the consideration of digital inclusion as a potential instrument to reduce rural depopulation; and training in advanced digital skills to improve the social communication processes, considered key to promoting empowerment and entrepreneurship.	Future researchers should focus on specific communities, while addressing connectivity and inclusion issues to support more personalized public policies.
4.	Sun et al. (2020). Factors Influencing Rumour Re-Spreading in a Public Health Crisis by the Middle-Aged and Elderly Populations China & Australia	A quantitative method (survey of 556 individuals)	This research helps the public to understand the rumour re-spreading behaviour of the middle-aged and elderly, which addresses the lack of literature in this area.	Middle-aged and older people demonstrate weakness in the areas of discrimination and media literacy and therefore easily become marginalized groups in the identification of rumours during pandemics.	The importance of increasing public knowledge expertise and of reducing public panic. This also has important implications for the future design of public health policies.
5.	Halvorsen, C. J & Yulikova O. (2020). Older Workers in the Time of COVID-19: The Senior Community Employment Program and Implications for Social Work USA	A review	The review relates to older workers and how they might be affected by this pandemic and its aftermath, paying particular attention to the most economically and physically vulnerable older workers, noting the uptick in technology use among older adults and the disparities that remain.	The conclusion has implications for program operators and gerontological social workers regarding technology use among financially vulnerable older adults, as well as social work scholarships and teaching methods that integrate concepts of cumulative disadvantage. It also calls for social work scholars to pursue additional collaborations with service providers for the aging and the older adults themselves.	Further plans include documenting the experiences of the Senior Community Service Employment Program (SCSEP) participants among a range of antecedents and outcomes at the individual, organizational, and community levels, as well as using participants' and case managers' own voices to shape program and policy recommendations to strengthen SCSEP.

Table 1: Summary of studies included (continues)

6.	Fischl et al. (2020). Tailoring to Support Digital Technology-Mediated Occupational Engagement for Older Adults - a Multiple Case Study Sweden	A qualitative method (nine cases with semi-structured interviews)	This study explores how tailoring support to enable older adults' engagement in digital technologies-mediated occupations could be schematized.	Findings focus on building relations and trust, and identify interests, needs, or goals in the close collaborative partnership between older adults and occupational therapists to achieve changes in occupational performance.	
7.	Tomczyk et al. (2020). Digital Inclusion from the Perspective of Teachers of Older Adults - Expectations, Experiences, Challenges and Supporting Measures Poland	A qualitative method (a structured in-depth interview with eight specialists - educators of older adults)	The aim of the study was to diagnose the needs of instructors working in the area of the digital inclusion of persons who are excluded, at risk of exclusion, marginalized, and discriminated against in terms of using new technologies.	The study is a significant contribution to the existing knowledge about the needs of people who work with the digitally excluded. The statements provided by the respondents are practical and result from their rich experience in working toward digital inclusion.	Further research could be oriented for other professions (social workers etc.)
8.	Nimrod, G. (2020). Technostress in a Hostile World: Older Internet Users Before and During the COVID-19 Pandemic Israel	A quantitative method (surveys with ICT users aged 60+ were conducted in 2016 (N=537) and during the COVID-19 pandemic of 2020 (N=407), examining technostress level, internet use patterns and sociodemographic background).	This study aimed at exploring individual and contextual antecedents to technostress (stress induced by Information and Communication Technology (ICT) use) among older ICT users.	The study suggests that internet use should not be perceived as panacea for constraining circumstances in later life - its use may add rather than alleviate stress. Practitioners should realize that different internet use may have varying impacts on different users, and should consider interventions to ease technostress among older adults and help them differentiate between adaptive and maladaptive uses.	Future studies should explore more diverse audiences, employ more accurate measures of media use and examine additional contextual antecedents, technostress inhibitors, types of content consumed, and attitudes and benefits gained from ICT use. Finally, intervention techniques and their efficacy in reduction of both technostress should be explored.

Table 1: Summary of studies included (continues)

9.	Lee et al. (2021). Can Older Workers Stay Productive? The Role of ICT Skills and Training Korea	A mixed method Different empirical techniques such as the inclusion of fixed effects and literacy skills scores and the adoption of regression imputation and IPW methods.	This paper quantitatively examines the effects of aging on labor productivity using individual worker data in Korea.	The results suggest that productivity decline due to the aging process can be mitigated by promoting training for older workers to equip them with adequate ICT skills, potentially giving a larger productivity than younger workers.	An important area for future research would be investigating the endogeneity issues in measuring the effects of aging on labor productivity, and the effects of ICT skills proficiency and job training on the labor productivity of older workers.
10.	Choudrie et al. (2021). Bridging the Digital Divide in Ethnic Minority Older Adults: An Organizational Qualitative Study UK	A mixed method	The study explores the digital divide in older adults when accepting and using smart devices within an organization.	The findings of this study suggest that bridging the digital divide leads to benefits for economies and societies. It implies that by using ICTs, older adults can remain independent, active and work for longer, leading to less pressure on public services, e.g. the social services sector. When the older adult belongs to an ethnic minority the impetus is even greater since their status and cultural differences also set them apart.	Future studies should focus on other smart devices, possibly concentrating on identifying the requirements of different cultural groups and the outcomes stemming from such cross-cultural differences.

4.1 ICT educational training courses as a part of human resources management

The articles described the deep digital divides that became apparent during the COVID-19 lockdown, and suggested which measures, interventions and services could be provided or offered. Human resource (HR) managers have been central to the response in organizations globally. Employees overcame many challenges during the COVID-19 pandemic and HR managers made decisions and devised strategies to manage their workforces. The pandemic revealed deep labor market and workplace inequalities linked to the widespread commodification of labor. The policies causing these inequities were often implemented by HR professionals and, in some cases, followed theories and concepts prepared and taught by HR academics (Butterick and Charlwood, 2021). Employers need to carefully manage the trade-offs between external conditions, such as the COVID-19 pandemic restrictions, and internal conditions such as the flexibilities and abilities of employees.

There are three aspects of resources able to reduce technostress and digital divide: a) digital resources (material made available online); b) human resources (in particular, literacy and education) and c) social resources (the community, institutional and societal structures that support access to IT) (Choudrie et al., 2021). ICT education and training during COVID-19 has taken center stage due to the demand. Based on the studies, ICT skills attainment positively affects the wages of the older workers aged 50–64 with a higher level of education, or in a skill-intensive occupation (Lee et al., 2021). Additionally, Esteban-Navarro et al. (2020) pointed out that obstacles

to the adoption and use of technologies arising from the existence of a lower than average level of education and computer skills in rural areas, rather than urban ones, were proven. HR employees need to consider these facts. Job training also has a significant positive impact on the wages of older workers (Lee et al., 2021, and Rolandi et al., 2020). Compared to younger workers, older and well-educated ones can be more productive through higher ICT skills attainment and job-training participation. The evidence suggests that a productivity decline in line with the aging process can be alleviated by training aging workers to equip themselves with ICT skills. Also, Nimrod (2020) emphasized that managers, e.g., HR personnel, should consider interventions that would ease technostress among older adults and help them differentiate between adaptive and maladaptive uses.

As the studies conducted by Butterick and Charlwood (2021), Lee et al. (2021), Esteban-Navarro et al. (2020), Rolandi et al. (2020) and Nimrod (2020) showed, the employer's interventions are crucial, including educational training courses, individual attitudes and skills, and mutual learning and skills transfer as a part of HR management. It is essential to study the distributional and welfare consequences of evolving approaches to managing people and organizing employment at multiple levels of inquiry.

4.2 Social dialog - a way to achieve a socio-economic optimum

Labor market exposure is driven by a mixture of factors, including: a country's economic specialization; the cost considerations for incorporating automation into their supply chains; the supply, cost, and skills availability in the labor force; and access to and the adoption of technologies. The quality of foundational education influences the capabilities of adults for adaptation, cost and quality of ICT connectivity, the prevalence of jobs incorporating digital exposure, and opportunities for lifelong learning.

Furthermore Fischl et al. (2020)), pointed out that a collaborative approach was used in tailoring discussions about goals and alternative solutions that supported older adults, enabling the adults to make informed choices relevant to their desired occupations. Tailoring also meant that the interventions implemented were individualized to fit the participants' needs and the context. Digital skills are essential for sustainable competitiveness, resilience and ensuring social equity. Enterprises need workers with the skills required to master the green and digital transitions, and people need to be able to get the proper education and training to thrive. Skills enable businesses to remain competitive, while ensuring social fairness for all. Accordingly, we argue that peer-trained programs or tailored support and education are critical for social dialog as lifelong education. As the studies show, the coronavirus crisis has highlighted the significance of having the right skills for strategic sectors to perform and for people to navigate through life and achieve professional transitions. It has emphasized the need for digital skills in several aspects of people's daily lives and for business continuation. While telework and distance learning has become a reality for millions of people in the EU, our current digital preparedness limitations were often revealed. An increase in older workers may hinder economic growth if the older workers are less productive than the younger ones due to the deterioration of their physical and cognitive abilities and the low tendency to adapt to new technologies. Sustaining the productivity of older workers is not an easy task; yet, if older workers are more educated and continue to improve their human capital through their job training, work experience, and acquisition of new skills after their formal education, they can stay productive (Lee at al., 2021). According to Lee et al. (2021), regarding participation in job training, the distance to the training center and availability of training facilities might be possible factors. And Nimrod (2020) reported that health rather than age plays a significant role in an older adult's ability to cope with the stress resulting from ICT use in adverse circumstances.

Building digital skills and capabilities is also possible through social dialog with peer-to-peer help. Halvorsen & Yulikova (2020) described how a team of two participants contacted their peers through the Senior Community Employment Program (SCSEP) to help them learn how to use Zoom and other technologies to stay connected. To support inclusion and retention in the working market older adult employees should have the opportunity to be (re-)trained and build digital skills and capabilities that help them cope with the any uncertainty during the transition to technological competence.

4.3 Building inclusive workplaces

The articles suggest that working conditions relate to the creation and implementation of work environments that facilitate attraction, engagement, and retention of staff. Building inclusive workplaces, where older adults will not feel technostressed and will maintain their job positions during any crisis, is related to this.

As Mannheim et al. (2019) note, there seems to be a discrepancy between the digital technologies that have been developed and the wants and needs of older adults. The priority is to recognize the needs of older adults in the context of ICT, and then design appropriate programs and professional education. Despite the potential of technology to improve many areas of older adult lives, this population has yet to fully benefit from technology, given their information and communication technology use is proportionately lower than in younger segments of the population. Indeed, some older adults are more likely than others

to adopt and benefit from ICT use, but the factors contributing to these individual differences in ICT use are not well understood. Telework may lead to what a technical report by the European Commission has characterized in May 2020 as a new digital divide, depending on the type of settlement. Only 29% of workers living in the rural world have accessed telework compared to 44% of those living in large cities and 35% in the suburbs during the pandemic (Esteban-Navarro et al., 2020). It is unknown how the pandemic will influence our future lifestyle and when and if we can resume our regular lives. This pervasive uncertainty makes it hard to plan and thus generates additional psychosocial stress (Vinkers, 2020). The implementation of HR management as a basic precondition for managing changes caused by external conditions must also be a part of building inclusive jobs.

Further, creating special programs for older employees in the framework of building inclusive workplaces is seen as one of the important strategies. Such temporary or short-term programs help, for example, to reintegrate participants in the workplace, whether that be a return to the physical workplace or remote work when possible (Halvorsen & Yulikova, 2020). Another of the assumed conditions for building and implementing inclusive workplaces is a targeted facilitation, support, and collaborative process. Esteban-Navarro et al. (2020) stressed the importance of a close collaborative partnership between older adults and occupational therapists as a part of HR management, to achieve changes in occupational performance. They also noted that goal setting took time and that older adults should be given time to identify and, if necessary, modify goals. However, Nimrod (2020) underlined that external pressure to adopt technologies or make more intense use of them could increase technostress levels. HR management should remember that it is important to trust the competence of occupational therapists for enabling older adults to increase their abilities and reduce stress from learning.

4.4 Implementation of successful aging in public policy documents

The included articles pointed out that one of the strategies to contribute to the inclusion and retention of the working market - not only during the COVID-19 pandemic - is an upgrade of public policies, with the focus on successful aging in the society.

As Monahan et al. (2020) pointed out, the COVID-19 pandemic has perpetuated agism, highlighting the need for swift policy action to remedy the effects and address the roots of agism. Raising public awareness of institutionalized agism in health care, the workplace, and other settings is a crucial starting point. This can be achieved by two interrelated factors essential to agism reduction: (a) providing education about aging; and (b) positive intergenerational contact experiences. While some sectors and industries successfully moved online, millions of workers have lost their livelihoods and many more – especially women who are concentrated in very exposed sectors – remain at risk. The employment policies must address potential age discrimination in the application of furloughs, reduced pay, layoffs, rehiring, and retirement, as the pandemic has already resulted in enormous job losses (Coibion et al., 2020).

The public authorities are compelled to design policies, make decisions, decrease public panic, and implement urgent and quickly effective measures that minimize digital gaps of any kind, including those of territorial origin, especially in the rural areas. If such work is not carried out, there would be an inequality of citizens and territories in their participation in the information and knowledge society (Esteban-Navarro et al., 2020; Sun et al., 2020).

COVID-19 employment policies need to address the continuity of all workers' employment, including potential barriers for older adults, such as their ability to telework given the nature of their job, as well as enforcing safety protections in the physical workplace to meet health guidelines (e.g., erecting barriers, providing protective gear, implementing adequate cleaning) (Monahan et al., 2020). Attention toward sustainable development goals has become more urgent, and they must guide the research being conducted in various fields. As our findings show, aging is not a single stage concept; there are a lot of theories about successful aging but there is no definitive answer. The most important point is to remain active in the working market, if possible, without being a victim of the digital divide and technostress.

In summary, the digital divide and technostress can be reduced with different strategies such as ICT education, social dialogue, building inclusive workplaces and the implementation of successful aging in public policies. Technologies place larger demands on all age categories, as well as changes in the way human resources are managed during the crisis. HR managers' efforts and attitudes are vital in reducing the digital divide and technostress for older adult employees for the next period, as is continually developing ICT and implementing policies to aid the involvement of the older generation. As technology continues to evolve and people age, it is necessary to keep the digital divide to a minimum and to ensure inclusion and sustainable development in the labor market.

5 Limitations and Strengths of the Scoping Review Approach

This scoping review has several limitations and strengths. The two main limitations are that, firstly, this review may not have identified all articles in the published

and gray literature, despite attempts to be as comprehensive as possible. The three reviewers used their judgment to determine whether each review sufficiently met our study definition of a scoping review. The second main limitation is that our search algorithm included 23 different terms used to describe our topic; however, other terms may also exist. Although our search included databases (i.e., CINAHL with full text, EBSCO, Medline, SocIndex, Web of Science) and Google Scholar, the overall search strategy may have been biased toward humanistic and social sciences. Searching other bibliographic databases may have yielded additional published original articles or reviews. While our review included any article published in Arabic, Czech, Danish, English, German, Norwegian, Slovak, or Swedish, we inputted only English terms in the search engines. The studies we finally included were published in English only.

Nevertheless, several strengths remain. Firstly, the study considered worldwide literature linked to the digital divide and technostress, focusing on older adult employees during the COVID-19 pandemic. In order to capture the wider available and relevant literature, we considered articles written in languages other than English. Secondly, it additionally considered the influence of the COVID-19 pandemic in the working market specifically to challenges in connection with digitalization.

6 Implication for Future Research and Practice

We consider that future studies should focus on ICT educational training courses for older adults and identifying the requirements of different cultural groups and the results of these intercultural differences. Furthermore, we suggest that the direction of further study should be a more detailed focus on the possibilities of ICT educational training courses, a comparison involving minority groups, and identifying the causes of the digital divide and ways to bridge them.

7 Conclusion

The goal of this study was related to challenges faced by older adult employees during the COVID-19 crisis, to propose effective strategies to reduce digital divide and technostress, and to support inclusion and retention in the working market. Social dialog is a way to achieve a socio-economic optimum through an effective means for identifying specific challenges and needs (e. g. ICT educational training courses such as: e-learning platforms, tutorials, workplace safety, free training classes or job training), reducing the digital divide and technostress. Furthermore, social dialog between employers and employees can also be a source of innovative and creative solutions (e. g. peer-trained programs or tailored support). Active cooperation with older adult employees - by asking what they need and want - to enable the development of skills through educational training should be a part of social dialog.

The lockdown during the pandemic has made more evident the importance of sustainable development goals. There are two needs; firstly, the creation and retention of jobs - as well as building an inclusive workplace - requires balancing investment in skills and technology and promoting a shift towards a more human-centered and inclusive digitalization; and secondly, a comprehensive and concerted effort involving all stakeholders to foster an inclusive and diverse workforce, implementing policy documents which focus on successfully aging.

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Od digitalnega razkoraka do tehnostresa med pandemijo COVID-19

Ozadje in namen: Članek proučuje na izzive, s katerimi se soočajo starejši odrasli zaposleni med krizo COVID-19, z namenom, da bi identificirali strategije za zmanjšanje digitalnega razkoraka in tehnostresa, s čimer bi podprli vključevanje starejših na trg dela. Starejši odrasli so še posebej ogroženi zaradi socialne izključenosti, povezane z internetom, zlasti med pandemijo COVID-19. Glavno raziskovalno vprašanje našega pregleda je: Kakšne strategije lahko zmanjšajo digitalni razkorak in tehnostres zaposlenih starejših odraslih ter prispevajo k njihovi vključitvi in ostajanju na trgu dela med pandemijo COVID-19?
Metodologija: Ta pregled za analizo uporablja okvir Arksey-a in O'Malley-a. Ogrodje šestih stopenj vključuje: opredelitev raziskovalnih vprašanj, opredelitev ustreznih študij, izbiro študije, načrtovanje podatkov, povzemanje in poročanje rezultatov ter interpretacijo rezultatov. Pregled je bil izveden z uporabo petih elektronskih baz podatkov – CINAHL s celotnim besedilom, EBSCO, Medline, SocIndex, Web of Science – in z dodatnim ročnim iskanjem, na Google Scholar. Iskanje je bilo omejeno na študije, objavljene od januarja 2020 do marca 2021. Po uporabi meril za vključitev in izključitev je bilo v analizo vključenih 10 člankov.
Rezultati: Raziskava kaže, da so najpomembnejše strategije: 1) izobraževalni tečaji IKT; 2) socialni dialog; 3) gradnja vključujočih delovnih mest; 4) izvajanje uspešnih politik „staranja v javnosti". Naši rezultati so koristni za posameznike, organizacije, industrije in družbo, saj kažejo, kako je mogoče konkretne strategije izvajati na več ravneh.
Zaključek: Študija je pokazala, da je ena najučinkovitejših strategij za zmanjšanje digitalnega razkoraka, s katerim se soočajo starejši odrasli zaposleni med krizo COVID-19 in tehnostresom, socialni dialog med delodajalci in zaposlenimi, ki je lahko vir inovativnih in kreativnih rešitev (npr. partnerski programi ali prilagojena podpora). Socialni dialog bi moral vključevati aktivno sodelovanje s starejšimi odraslimi zaposlenimi – spraševanje, kaj potrebujejo in želijo, da bi lahko z usposabljanjem podprli pridobivanje in razvoj spretnosti.

Ključne besede: *COVID-19, Digitalni razkorak, Starejši odrasli, Zaposleni, Tehnostres*

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Influence of Parental Experience on Transformational Leadership Behaviour: A Test of Work–Family Enrichment of Male Managers from an Employee Perspective

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Background: When a male leader becomes a father, changes in his transformational leadership behaviour occur due to shifted priorities, role expectations and resource transfer between domains. Work–life enrichment research acknowledges the positive overall effects of fatherhood on overall transformational leadership behaviours. Our quantitative study contributes to existing knowledge by analysing the perception of behavioural changes of leaders from the employees' view. The results are matched with previous studies to assess differences of perception between leaders and employees.
Methods: Our research uses a granular, detailed definition of transformational leadership. Based on a sample of 139 respondents, we test the positive effects of fatherhood on leadership performance with Wilcoxon signed rank sum tests.
Results: 13 out of 15 transformational leadership behaviours improve significantly with fatherhood. We find that leaders and employees view change differently. Employees perceive improvement similarly in terms of direction, but it is less pronounced in terms of magnitude. Moreover, we find that well rated leaders tend to benefit the most from fatherhood, at least from the perspective of their employees. Males perceive higher levels of improvement than females, which we attribute to a gender empathy bias.
Conclusion: Our study confirms work–family enrichment theory and the positive effects of fatherhood on transformational leadership behaviour. Nevertheless, we show that not all involved parties perceive behavioural changes conformably.

Keywords: *Multiple roles, Work–family enrichment, Parenthood, Fatherhood, Transformational leadership behaviour*

1 Introduction

Most people become parents sooner or later. The life-changing effects of parenthood are well described in the literature, being typically associated with behavioural changes and increased responsibilities (Graves et al., 2007; van Scheppingen et al., 2016). Parents who undertake multiple roles can enrich their competency and resources in their different roles through inter-role transfer. Even though parents are confronted with additional sources of conflict, enrichment typically overweighs these (Greenhaus & Powell, 2006). Work-family research frequently has a strong, one-sided focus on the issues of females (Heikkinen & Lämsä, 2017). Therefore, male leaders attaining fatherhood are a specific research subject in this context. Taking over responsibility for others, providing them with necessary resources to let them advance, motivating and supporting them, but also taking necessary

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corrective actions are evident parallels between raising a child and leading employees. These capabilities, described in the work-family enrichment model, have the potential to be transferred between roles and can lead to enrichment and improved performance (Greenhaus & Powell, 2006). These positive behavioural influences of fatherhood on leadership have been examined at different levels of granularity so far. However, measuring leadership behaviour has lacked rigorous objectivity and may involve a variety of different methods and perspectives

The present research wants to verify the applicability of the work-family enrichment model for fathers who hold managerial positions. As we assume that their employees/followers have a stake in evaluating potential behavioural changes, our research aims to analyse employees' perception. By staying consistent with the methodology of our previous research (Stellner, 2021), we enable direct comparison with the self-evaluation of leaders and elaborate on the differences in perception regarding behavioural changes in terms of direction and magnitude.

2 Literature Review

2.1 Fatherhood Role

Roles are a set of expectations that relate to a particular social position and which are normally persistent regardless of the person occupying that position (Sieber, 1974). If an individual is active in more than one role, as is usually the case, we speak of multiple roles. Fatherhood is such a role, but by its very nature is not a role that men are born into. The meaning of the paternal role is shifting in the current social context. Altering social settings, family arrangements and policies are the key drivers for this re-elaboration process. While historically men lived this role rather as breadwinners, providers of shelter and resources, Western societies nowadays require men to be increasingly involved in raising children. Men with the latter role identification show high active availability in terms of time and attention (Dermott & Miller, 2015; Humberd et al., 2015). Accordingly, couple duties typically transcend a rigorous separation of income and household duties (Humberd et al., 2015). Combining fatherhood and work is steadily and more often being considered a part of the "package deal", resulting in similar work–family conflicts as for women (Townsend, 2002; Ladge et al., 2015).

The transition to fatherhood is "a critical juncture in men's development" (Palkovitz & Palm, 2009). Unlike in other roles such as occupation or relationship, becoming a father is an irreversible event (Bleidorn et al., 2016). Fatherhood is said to act as a catalyst for personal development, and changes one's societal role, self-construal and priorities. It is regarded as one of the most momentous events in a man's life, with the potential to realign personal values (Dahl et al., 2012). Nevertheless, this transition process of parenthood in general and specifically its effects on personality and behaviour have received little attention in research so far (Bleidorn et al., 2016; van Scheppingen et al., 2016). Different research designs have led to inconclusive results as to whether parenthood influences character traits mainly positively (Jokela et al., 2009), negatively (Specht et al., 2011; Bleidorn et al., 2016) or not significantly at all (van Scheppingen et al., 2016). Traits themselves are defined as dimensions of difference expressed in action, thought and feeling (Nichols, 2016). Bleidorn et al. (2016) have observed a reduction of self-esteem among persons upon becoming a parent, a fact which could be especially critical for people in management positions. Besides, there is ongoing speculation amongst scholars about whether males are less affected by the parenthood transition because they lack the pregnancy and other gender-specific role expectations (van Scheppingen et al., 2016; Asselmann & Specht, 2020). It is fairly obvious that conventional parenting goals like sustenance, stimulation, support, structure and surveillance for/of children have similarities with those of leaders at work. With males' increasing participation in childcare, such experience could be of value in other domains as well.

2.2 Work–Family Enrichment

Earlier research on multiplicity of domains has focused on the conflictual aspects, assuming that being active in one role leads to a drain and scarcity of resources in other roles. "If he conforms fully or adequately in one direction, fulfilment will be difficult in another" (Goode, 1960). The main assumption is that multiple relationships with different role partners cause mental stress and social instability, subsumed as the scarcity approach (Sieber, 1974). Both energy, time and attention are available to a predetermined extent only. Any deduction therefrom reduces the balance available (Goode, 1960). In managerial practice, this would mean that a leader who does volunteer work or has become a father has less time and resources available than before. Ultimately, this results in decreased performance at the workplace. Sieber assumes that individuals pursue a bargain as to the domain to which they can assign resources. The goal is to maximise personal value. In this process, potential rewards, negative consequences and others' perspectives are considered (Sieber, 1974). Despite this rather negative viewpoint, Goode also notes that some roles (like family) drain much less energy than others (Goode, 1960).

Marks picks up Goode's notion that some roles only drain a little energy while assuming that these roles may also create energy for use in the same or another role. Basically, his argumentation is built on the sociological approaches of David E. Durkheim suggesting that being involved in social groups has a positive, enriching, and vi-

talising effect. Group life and activity by being involved in roles are therefore energy-expanding measures. Marks compares the psychological effects of social activity in diverse roles with the biological process of creation and consumption of adenosine triphosphate (ATP), arguing that production of human energy is inseparably connected with its consumption. Therefore, under normal conditions, consumption of energy and being active in one role constitute the basis for producing more energy that can be utilised in another role. Moreover, Marks also draws the parallel to malnutrition, excessive stress and activity, arguing that these abnormal conditions lead to excessive drain of energy (Marks, 1977).

While the benefits of taking on many roles were reiterated by later research (Barnett & Hyde, 2001; Ruderman et al., 2002), a holistic model of work–family enrichment (Figure 1) through the direct and indirect effects of multiple roles on each other was established by Greenhaus and Powell (2006) in their seminal paper. Work–family enrichment describes the idea that the work and family domains are interdependent and complementary. The authors still assume a coexistence of conflict, a psychological stressor, and enrichment, a phenomenon of development through transfer between roles or "the extent to which experiences in one role improve the quality of life in the other role" (Greenhaus & Powell, 2006). Between two roles, conflict and enrichment unfold their effects in all directions. Typically, enrichment outweighs conflict in its extent, resulting in a net enrichment. The authors distinguish between five groups of resources that lead to enrichment: Skills and perspectives, psychological and physical resources, social capital resources, flexibility, and material resources. Enrichment between roles may happen along two pathways. Direct improvement of performance happens through the instrumental path, while the positive influence of emotions leads to indirect enrichment along the affective path (Greenhaus & Powell, 2006). Greenhaus and Powell's model is still considered a valid and actual framework (Lapierre et al., 2018; Zhang et al., 2018). Recent research in the context adds the perspective of attachment theory pointing towards the within-person, daily study of leadership behaviour and work-family enrichment (McClean et al., 2021).

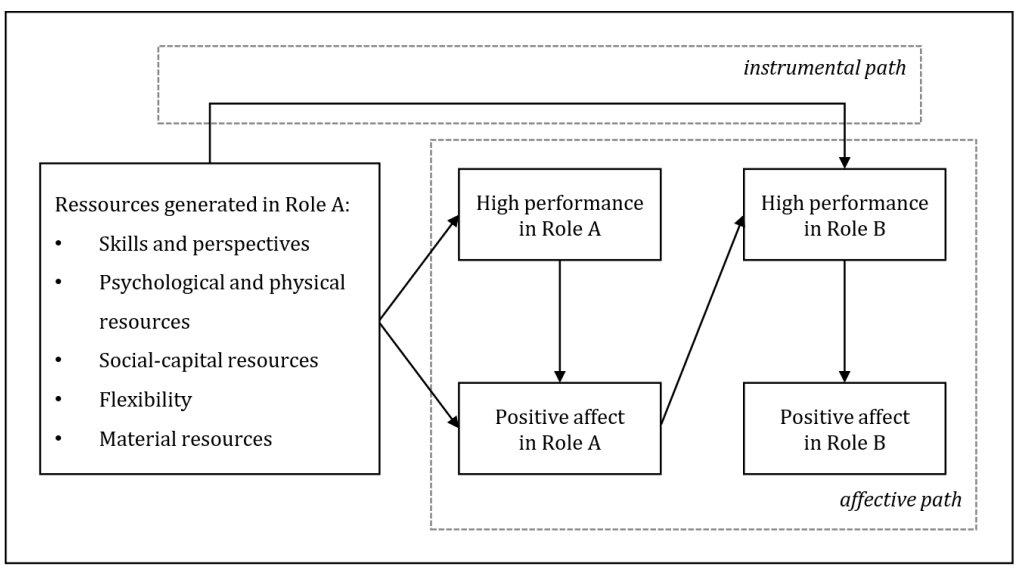

Figure 1: Model of Work-Family Enrichment (Greenhaus and Powell, 2006)

2.3 Leadership Measurement

There has been a long debate on the difference between leadership (leaders) and management (managers). A widely accepted separation suggests that leadership is about dealing with change (innovation, development, future, etc.), while management is about dealing with complexity (processes, administration, systems, etc.). Leadership typically follows a people-oriented approach, whereas management has a subject-oriented view (Zaleznik, 1977; Kotter, 1990; Kotterman, 2006). Still others argue that leadership is a role within management (Mintzberg, 1971). For the present research we rely on the literature and concepts on measuring leadership behaviours, as we believe that the people-orientation within changing environments is more relevant for fathers. Specifically, we focus on transformational leadership, as it dominates academic discourse (Bass, 1990; Yukl, 2012; Dumas & Stanko, 2017). In the present research, we mainly use the term "leader"

incorporating designations such as manager, supervisor, superior and boss.

To measure transformational leadership behaviours (TLB), we use the taxonomy of Yukl (2012), which is based on a meta-categorisation of a total of ten already existing and recognised questionnaires (C-K Scale, LBDQ-12, LOS, LPI, MBS, MPS, MLI, MLQ, MP, TLI). Yukl describes four meta-categories with a total of 15 specific TLB that leaders show:

- Task-oriented TLB

- Planning: *develops short-term plans for the work; determines how to schedule and coordinate activities to use people and resources efficiently; determines the action steps and resources needed to accomplish a project or activity.*

- Clarifying: *clearly explains task assignments and member responsibilities; sets specific goals and deadlines for important aspects of the work; explains priorities for different objectives; explains rules, policies, and standard procedures.*

- Monitoring: *checks on the progress and quality of the work; examines relevant sources of information to determine how well important tasks are being performed; evaluates the performance of members in a systematic way.*

- Problem solving: *identifies work-related problems that can disrupt operations, makes a systematic but rapid diagnosis, and takes action to resolve the problems in a decisive and confident way.*

- Relations-oriented TLB

- Supporting: *shows concern for the needs and feelings of individual members; provides support and encouragement when there is a difficult or stressful task, and expresses confidence members can successfully complete it.*

- Recognising: *praises effective performance by members; provides recognition for member achievements and contributions to the organization; recommends appropriate rewards for members with high performance.*

- Developing: *provides helpful feedback and coaching for members who need it; provides helpful career advice; encourages members to take advantage of opportunities for skill development.*

- Empowering: *involves members in making important work-related decisions and considers their suggestions and concerns; delegates responsibility and authority to members for important tasks and allows them to resolve work-related problems without prior approval.*

- Change-oriented TLB

- Advocating change: *explains an emerging threat or opportunity; explains why a policy or procedure is no longer appropriate and should be changed; proposes desirable changes; takes personal risks to push for approval of essential but difficult changes.*

- Envisioning change: *communicates a clear, appealing vision of what could be accomplished; links the vision to member values and ideals; describes a proposed change or new initiative with enthusiasm and optimism.*

- Encouraging innovation: *talks about the importance of innovation and flexibility; encourages innovative thinking and new approaches for solving problems; encourages and supports efforts to develop innovative new products, services, or processes.*

- Facilitating collective learning: *uses systematic procedures for learning how to improve work unit performance; helps members understand causes of work unit performance; encourages members to share new knowledge with each other.*

- External-oriented TLB

- Networking: *attends meetings or events; joins professional associations or social clubs; uses social networks to build and maintain favourable relationships with peers, superiors, and outsiders who can provide useful information or assistance.*

- External monitoring: *analyses information about events, trends, and changes in the external environment to identify threats, opportunities, and other implications for the work unit.*

- Representing: *lobbies for essential funding or resources; promotes and defends the reputation of the work unit or organization; negotiates agreements and coordinates related activities with other parts of the organization or with outsiders.*

Yukl's taxonomy does not come with a final questionnaire. Yet, we already successfully applied it by confronting survey respondents (leaders) with the 15 definitions and collecting their perceptions of change. Cronbach's alpha values for the questions were consistently above 0.87 level (Stellner, 2021). We are confident that the concept can also be applied to other observers like colleagues, employees, superiors of leaders, and externals.

2.4 Previous Research

Empirically, the enriching influence of parental experience on management/leadership performance has been shown in various studies. Ruderman et al. (2002) demonstrated the positive impact of multiple roles on the psychological well-being and managerial skills of females. Their interviewees frequently reported that multiple roles offer the opportunity to enrich interpersonal skills like understanding, motivating, listening, respecting, being patient and developing others. Mothers in particular stated that they learned and respected that each employee is akin to a child, requiring a high degree of attention for personal growth and development. Also, mothers reported feeling more comfortable in roles of authority. Ruderman et al. showed the positive effects of parenthood and rejected the scarcity theory, thereby facilitating the development of the work–family enrichment model (Greenhaus & Powell, 2006). Nevertheless, they assume the existence of limits beyond which taking on too many roles results in overload

and role stress, thus depleting overall performance. Based on a quantitative study involving male and female managers, Graves et al. (2007) tested Greenhaus and Powell's theory of enrichment. Similar to Ruderman et al. (2002), they found that commitment for the parental role and work performance of managers are linked for both genders. Nevertheless, their definition of leadership does not allow conclusions to be drawn on which specific leadership attributes change. Contrary to Graves et al. (2007), later research finds a gender difference, in that female managers show higher levels of improvement in leadership behaviour than males (Dumas & Stanko, 2017). Still, they argue that the skills needed for leadership and in a family role are analogous and transferable from family to work, and they found improved overall TLB. Other qualitative studies confirm this overall trend with a male sample (Grau Grau, 2017). More recent research confirms the mediating role of empathy and improved management skills with fatherhood experience (Nunes-Costa et al., 2020) and that family may increase the application of transformational leadership behaviours (McClean, 2021). Nevertheless, Pučėtaitė et al. (2020) also find that male managers experience high levels of conflict in the field of tension between work and family. Stellner (2021) validates the role of parental role commitment and (net) enrichment in a broad set of 15 TLB with a sample of 159 male managers from Central Europe. Both factors positively influence leadership skills. Stellner finds that 14 out of 15 behaviours improve significantly with fatherhood. While the behaviours supporting, recognising, and developing advance the most, only networking remains unaffected. As the study relies on self-perception of the managers only, it is subject to a potential positivity bias.

With regard to how management/leadership performance is assessed, previous studies differ in their methods and target groups. While Ruderman et al. (2002) and Graves et al. (2007) assessed the performance of leaders using a holistic approach that considered subordinates, peers and superiors, later research on male leaders had one-dimensional perspectives with supervisor ratings (Dumas & Stanko, 2017) and self-evaluations (Grau Grau, 2017; Nunes-Costa et al., 2020; Stellner, 2021). To our knowledge, there is still lack of a methodologically congruent assessment of TLB changes for men from the subordinates' and leaders' perspective.

3 Research Gap and Objectives

As discussed in chapter 2.4 positive effects through enrichment by parenthood have been shown in prior research. For fathers, the data are still relatively scarce. While recent studies (Dumas & Stanko, 2017; Nunes-Costa et al., 2020) applied a more general definition of leadership, Stellner (2021) chose a more granular, detailed approach with Yukl's 15 transformational leadership behaviours (Yukl, 2012). Although managers perceive significant improvement in most of their leadership behaviours (Stellner, 2021), there is a research gap on how other involved parties perceive changes in fathers' transformational leadership behaviour, if at all. Ruderman (2002) had pointed out this gap already when female leaders were examined. We consider direct employees close to what is happening in everyday leadership and eligible for evaluating their superiors' behavioural changes. Their perception of TLB change from the employees' angle provides an alternative view and fills a gap in research. Moreover, we respond to the call to examine leadership as a multi-faceted phenomenon (Nunes-Costa et al., 2020).

Motivated by literature that suggests that the transition to fatherhood acts as a change agent for behaviour of leaders (Greenhaus & Powell, 2006; Dumas & Stanko, 2017), this work should contribute to build the theoretical bridge between fatherhood and leadership. Specifically, this study sought to verify the work–family enrichment model from the angle of employees. By matching the results of this study with those of a previous one (Stellner, 2021), we aimed to compare the congruency of perceptions of employees and leaders. Therefore, we set up a series of hypotheses for testing. Moreover, we intended to gain a more detailed understanding regarding which attributes of employees and leaders change the perception of behavioural changes, using a linear regression model.

4 Hypotheses Development

Theory on work–family enrichment proposes that fatherhood leads to both enrichment and conflict at the workplace. Enrichment outweighs conflict in its effects. As a result, leaders can benefit at work from their fatherhood experience by both the affective and instrumental paths. Especially via the fields skills and perspectives, psychological and physical resources, and social capital resources enhanced leadership behaviour can be induced (Greenhaus & Powell, 2006). These positive influences of fatherhood on general leadership behaviour have been demonstrated by previous research (Graves et al., 2007; Dumas & Stanko, 2017; Nunes-Costa et al., 2020). Stellner (2021) showed that leaders perceive their aggregated, clustered, and 14 of 15 individual TLBs as improving with fatherhood. We assume that this general tendency of perception also holds true for employees of leaders who became fathers during their cooperation.

Hypothesis 1: Employees perceive an improvement of aggregated transformational leadership behaviour when their leader attains fatherhood.

Hypothesis 2: Employees perceive an improvement of task-oriented transformational leadership behaviour when their leader attains fatherhood.

Hypothesis 3: Employees perceive an improvement of relations-oriented transformational leadership behaviour

when their leader attains fatherhood.

Hypothesis 4: Employees perceive an improvement of change-oriented transformational leadership behaviour when their leader attains fatherhood.

Hypothesis 5: Employees perceive an improvement of external-oriented transformational leadership behaviour when their leader attains fatherhood.

Previous studies on leadership have shown mixed results regarding the significance of differences between self-evaluation and evaluation by observers. Even though observers' average rating tends to be higher (better) than leaders' self-rating, mean values were found to lie within one standard deviation of the normal distribution (Herbst & Conradie, 2011; Posner, 2016). Importantly, no such comparative studies are known regarding an event-related change of leadership style. Specifically, studies on changes in leadership behaviours caused by parenthood are not available in sufficient numbers and with consistent methodology to draw conclusions on the difference in perceptions of leaders and employees. It is solely for the direction of change in aggregated TLBs through fatherhood, therefore, that we assume conformity. We also expect conformity in terms of magnitude of change in transformational leadership behaviours.

Hypothesis 6: Employees and leaders perceive changes of transformational leadership behaviour conformably in terms of direction and magnitude.

5 Methods

5.1 Design

We follow an empirical-quantitative approach to test the hypotheses. Employees of leaders who became fathers were asked via an anonymous web-survey about their perception of changes of TLB. We methodically asked respondents to think of and focus on one specific leader, before confronting them with questions on this person. Someone was defined a leader in the professional environment if he, irrespective of his performance in the role and the scope of work, has at least one direct (in line) or project-related subordinate. As part of our study uses data from previous research, we want to clarify that we did not necessarily assess the same fathers.

5.2 Sample, Variables and Data Collection

The relevant population size (employees primarily resident in Austria and Germany who have a leader who has become a father during the cooperation) cannot be determined with precision. Nevertheless, we expect the number of individuals to be in the double-digit millions. Therefore, we estimated the minimum sample size with another method. Rules of thumb for linear regression would propose 100 responses (ten per predictor). A margin of error of 10% and confidence levels of 95% result in a similar minimum sample size (Cohen, 1992).

For the analysis of the work–family enrichment model and testing of the individual hypotheses, various data and items were collected. The 15 TLB by Yukl (e.g. clarifying, supporting, networking) and their definitions were individually presented to the participants. Then, they were asked to indicate their perception of change of TLB. We applied a 5-point Likert scale with answers ranging from "strongly improved" (1) through "unchanged" (3) to "strongly worsened" (5). Respondents could also choose "not applicable". Therefore, values below 3 suggest improvement of TLB. We created average scores for clustered TLB and aggregated TLB. Respondents were asked to spontaneously rate their supervisors' overall leadership performance on a scale with one to five stars. This item was collected before any question on change of TLB was asked, to reduce potential bias. Gender was of interest to cover potential differences in perception of change in the sample. We controlled for age in years of the employees to account for experience and difference in perception. Moreover, we asked about the estimated age in years at which the leader became a father. Weekly work hours of the employees were also collected, as that could have an influence on how much employees are affected by their supervisors' leadership behaviour. Education (seven categories from primary school to PhD) and relationship status (yes/no) were considered as demographic control variables. The employees' number of children was collected to control for potential effects of empathy with the superior. Current position (five categories from junior to CEO) and number of subordinates of the employee were also collected as one could perceive behaviours differently, if she or he is also in a leadership position.

Our questionnaire consisted of 30 questions in both English and German. We used the SurveyMonkey platform to both create and distribute the survey via different digital channels. We tapped both the authors' personal network (ca. 2/3 of the total sample) and a professional, external panel (ca. 1/3 of the total sample). No specific companies or industries were targeted. Geographically, the core area was Austria and Germany. Data collection was finished in Q2/2021, with 139 complete responses. By integrating various screening questions, we excluded respondents who did not fulfil our requirements. Moreover, unrealistically quick responses were eliminated.

6 Results

6.1 Descriptive Statistics

We tested for Cronbach's alpha values of the 15 items for TLB to ensure reliability. The alpha value was 0.91, which indicates a high internal consistency of the scale.

The overall final sample consisted of 139 participants and was primarily male (59%), 41 years old on average, married or in a registered partnership (61.9%), from Austria (48.9%) and Germany (45.3%), had none or up to two children (92.8%), held a Bachelors' degree or higher (61.2%), had a monthly household income ranging from €2.000 to €5.999 (61.2%), was middle manager (33.1%) or employee with experience (34.5%), and worked 43.1 hours weekly on average. The evaluated 139 leaders had a mean age of 35.8 years when the evaluated fatherhood event happened and received a spontaneous performance rating of 3.8 out of 5 stars. Average values of aggregated, clustered and individual TLB are indicated in the following sections of the paper.

6.2 Hypotheses Testing

Table 1 summarises the results of a sequence of Wilcoxon signed rank sum tests in which we tested collected data of aggregated, clustered and individual TLB against the null hypothesis with the value 3 ("unchanged" TLB). Values of TLB below 3 indicate perceived improvement, while values above 3 imply perceived worsening.

Hypothesis 1 related to the change in aggregated TLB. On average, employees' (M = 2.68) ratings were significantly lower than 3 ("unchanged") (Z = -6.34, p < .001). Employees' typical response was closer to 3 ("unchanged") than to 2 ("slightly improved") on the Likert scale. The distribution of the aggregated responses is visualised in Figure 2. Hypothesis 1 is accepted.

Hypothesis 2 examined change in task-oriented TLB. As with the prior analysis, typical responses were significantly below 3 for employees (M = 2.70, Z = -4.82, p < .001). Hypothesis 2 is accepted.

Hypothesis 3 considered changes in relations-oriented TLB. Again, employees (M = 2.49, Z = -7.66, p < .001) showed responses significantly different from 3. Responses were closest to 2 ("slightly improved"). Hypothesis 3 is accepted.

Hypothesis 4 was concerned with changes to change-oriented TLB. The Wilcoxon signed rank tests found that responses were significantly different from 3 for employees (M = 2.71, Z = -4.98, p < .001). Ratings were closest to "unchanged", but still significantly different from the corresponding value. Hypothesis 4 is accepted.

Hypothesis 5 addressed external-oriented TLB. Employees' responses (M = 2.89, Z = -2.17, p = .03) were again significantly below 3, yet closest to "unchanged". It is noteworthy that change in external-oriented TLB was the only cluster in which all individual behaviours were not significantly different from 3. The individual TLB networking and external monitoring showed no significant changes. However, Hypothesis 5 is accepted.

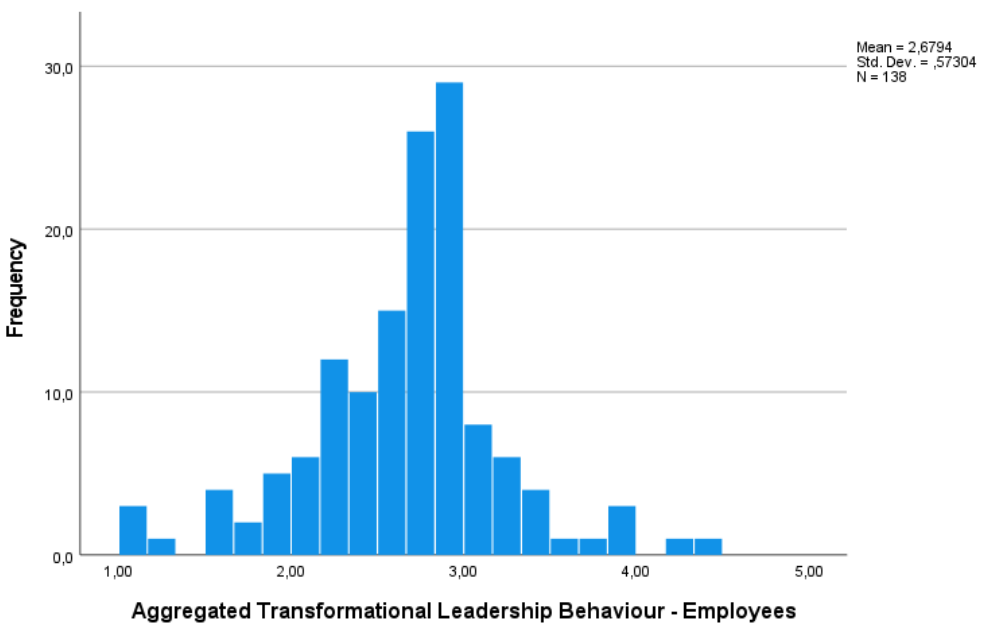

Figure 2: Histogram of Aggregated Transformational Leadership Behaviours of Employees

Table 1: Perceived Changes in Transformational Leadership Behaviour

Variable	*M*	*Z*	*p*
Aggregated TLB	2.68	-6.34	<.001***
Task-Oriented TLB	2.70	-4.82	<.001***
Planning	2.67	-4.08	<.001***
Clarifying	2.68	-4.00	<.001***
Monitoring	2.70	-3.61	<.001***
Problem Solving	2.72	-3.61	<.001***
Relations-Oriented TLB	2.49	-7.66	<.001***
Supporting	2.19	-7.57	<.001***
Recognising	2.45	-6.14	<.001***
Developing	2.69	-4.03	<.001***
Empowering	2.59	-4.80	<.001***
Change-Oriented TLB	2.71	-4.98	<.001***
Advocating Change	2.70	-3.81	<.001***
Envisioning Change	2.77	-2.87	.004**
Encouraging Innovation	2.61	-4.77	<.001***
Facilitating Collective Learning	2.71	-3.46	<.001**
External-Oriented TLB	2.89	-2.18	.03*
Networking	3.12	-1.27	.20
External Monitoring	2.88	-1.68	.09
Representing	2.64	-4.02	<.001***

Note. n = 139, * p < .05, ** p < .01, *** p < .001. TLB = Transformational Leadership Behaviour. Lower values indicate improvement, higher responses indicate worsening. Wilcoxon signed rank tests used to determine significant differences from 3 ("unchanged").

Hypothesis 6 was tested comparing current data with data of our previous research (Stellner, 2021). We determined whether there is a difference between perceived changes of TLB between employees and leaders. This is especially of interest since leaders have seemingly lower average ratings concerning hypotheses 1 to 5 (Stellner, 2021). Aggregated TLB ratings were directly compared for employees and leaders using a Mann-Whitney U test. Leaders' overall estimation of change in TLB was more positive (M = 2.41) than employees' (M = 2.68). This difference of 0.27 in absolute terms was shown to have high statistical significance (U = 7429.20, p < .001). Going beyond testing Hypothesis 6, which covers aggregated TLB only, and analysing the differences of the clustered and individual behaviours in greater detail with further Mann-Whitney U tests, we find that there is indeed congruity between employees' and leaders' perceptions. Averaged differences on the Likert scale of individual TLB range between 0.47 (developing) and 0.05 (networking). The cluster external-oriented TLB in particular is perceived conformably between leaders and employees. In Table 2 we show a detailed data analysis which also facilitates interpretation of Figure 3. Besides that, it appears that perceptions of individual TLB shift almost parallelly between the two samples. Direction of change is perceived similarly, while magnitude of change is not. A visual representation of this difference can be found in Figure 3. Overall, aggregated TLB is not perceived conformably between employees and leaders. Therefore, Hypothesis 6 is rejected.

6.3 Regression Analysis

Moving into more exploratory analysis, a series of regression analyses was also carried out among employees, where changes in TLB were predicted from supervisor ratings and other collected control variables. We used the following attributes of employees: supervisor rating, gender, age, education, working hours, relationship status, current position, number of children and number of subordinates. Moreover, we added age of the leader when becoming a father as a control variable. Gender of participants was coded 1 = Male, 0 = Female. In keeping with the coding used for survey items, the control variables were coded such that lower numerical values reflected higher real-world

Table 2: Differences between Leaders' and Employees' Perception of Change

Variable	Employees' Responses (*n* = 130-138)	Leaders' Responses (*n* = 147-157)	*p*
Aggregated TLB	2.68	2.41	< .001***
Task-Oriented TLB	2.70	2.34	< .001***
Planning	2.67	2.26	< .001***
Clarifying	2.68	2.29	< .001***
Monitoring	2.70	2.54	.116
Problem Solving	2.72	2.28	< .001***
Relations-Oriented TLB	2.49	2.15	< .001***
Supporting	2.19	2.00	.054
Recognising	2.45	2.15	.002**
Developing	2.69	2.22	< .001***
Empowering	2.59	2.24	< .001***
Change-Oriented TLB	2.71	2.44	< .001***
Advocating Change	2.70	2.38	< .001***
Envisioning Change	2.77	2.52	.01**
Encouraging Innovation	2.61	2.36	.006*
Facilitating Collective Learning	2.71	2.52	.060
External-Oriented TLB	2.89	2.79	.389
Networking	3.12	3.07	.919
External Monitoring	2.88	2.77	.322
Representing	2.64	2.58	.777

Note. * p < .05, ** p < .01, *** p < .001. TLB = Transformational Leadership Behaviour. Mann-Whitney U Test used to assess differences in perception. Data for leaders stem from our previous research (Stellner, 2021)

levels (e.g. for education 1 = "PhD" and 7 = "Primary school"). Supervisor ratings were coded so that lower values represented more positive ratings in data analysis. This gives them the same directionality as change in TLB responses and avoids confusion. Positive β means that a higher value of a variable relates positively to behavioural improvements.

6.4 Regression Analysis

Moving into more exploratory analysis, a series of regression analyses was also carried out among employees, where changes in TLB were predicted from supervisor ratings and other collected control variables. We used the following attributes of employees: supervisor rating, gender, age, education, working hours, relationship status, current position, number of children and number of subordinates. Moreover, we added age of the leader when becoming a father as a control variable. Gender of participants was coded 1 = Male, 0 = Female. In keeping with the coding used for survey items, the control variables were coded such that lower numerical values reflected higher real-world levels (e.g. for education 1 = "PhD" and 7 = "Primary school"). Supervisor ratings were coded so that lower values represented more positive ratings in data analysis. This gives them the same directionality as change in TLB responses and avoids confusion. Positive β means that a higher value of a variable relates positively to behavioural improvements.

Skewness and kurtosis fall within acceptable bounds for normality among all variables. The regression models were also shown to have acceptable homogeneity of variance and normally distributed residuals based on graphical analysis of the calculated residuals. No extreme outliers, or data values with high distance were observed. The models met the assumptions for acceptable linear regression.

Figure 3: Difference in Perceived Behavioural Changes between Leaders and Employees

The regression models for aggregated TLB ($F(10, 123) = 4.83$, $p < .001$), task-oriented TLB ($F(10, 123) = 5.19$, $p < .001$), relation-oriented TLB ($F(10, 123) = 2.96$, $p = .002$), change-oriented TLB ($F(10, 122) = 4.19$, $p < .001$) and external-oriented TLB ($F(10, 122) = 2.50$, $p < .01$) were all significant. The overall regression models accounted for 17% to 30% of total variance in the outcome variables, which is a high value compared to other studies (Ruderman et al., 2002). Results are summarised in Table 3.

Spontaneous rating of the supervisor ($M = 3.83$) was a highly significant predictor of outcomes, with β values ranging from .26 to .44. The higher the general rating, the stronger the perceived improvement of TLB with fatherhood. Gender significantly predicted change in aggregated ($\beta = .18$, $p = .04$), task-oriented ($\beta = .17$, $p = .04$) and change-oriented TLB ($\beta = .21$, $p = .01$). In these clusters, male participants perceived their leader's improvement as significantly higher than did female participants. Working hours was a predictor of change-oriented TLB, with low significance ($\beta = -.20$, $p = .04$). None of the other control variables were found to have predictive power on TLB.

As we deem the gender effect both interesting and problematic, we split up our sample into male and female portions. We then repeated the Wilcoxon signed rank test for all TLBs to account for possible peer support amongst men. It could be the case that male employees feel empathy for their male leaders and therefore report higher improved TLB. Females, on the contrary, could have a more objective perspective. The results in Table 4 indicate that females observe a significant improvement of TLB only for supporting ($p < .001$), recognising ($p < .001$), developing ($p = .05$), empowering ($p = .04$) and encouraging innovation ($p = .001$). We refrain from rejecting hypotheses 1 to 5, as males also form part of employees and we specifically investigated perception. Nevertheless, this finding could indicate that leadership performance (change) perception depends highly on the background and experience of the affected persons.

7 Discussion

7.1 Contribution

Our findings are consistent with and confirm previous research, in that they find a general tendency towards perceived improvement of TLB with fatherhood (Dumas & Stanko, 2017; Nunes-Costa et al., 2020). The work–family enrichment model seems to be valid also when tested from the perspective of employees. Nevertheless, directly compared to previous research with a sample of leaders (Stellner, 2021), we find that perceived improvement of TLB is less pronounced, with averaged differences on the Likert scale ranging between 0.47 (TLB developing) and 0.05 (TLB networking). We find that only external-oriented TLB is perceived equally by both employees and leaders. This is surprising, as one would expect self-eval-

Table 3: Prediction of Change in Transformational Leadership Behaviours of Employees

Outcome Variable	*B*	*SE*	*β*	*t*	*F*	*Df*	*p*	R^2
Aggregated TLB					4.83	10, 123	< .001	.28
Constant	-0.06	2.22		-0.03			.98	
Supervisor Rating	0.24	.04	**.44**	5.54			**< .001**	
Gender	0.20	.10	**.18**	2.13			**.04**	
Age	0.01	.00	.12	1.43			.16	
Education	-0.02	.04	-.06	-0.65			.52	
Working Hours	-0.01	.01	-.14	-1.51			.13	
Relationship Status	0.10	.12	.04	0.43			.67	
Current Position	-0.01	.05	-.03	-0.28			.78	
Number of Children	0.00	.05	.01	0.09			.93	
Subordinates	0.00	.00	.01	0.96			.34	
Age of Leader	-0.01	.01	-.01	-0.86			.39	
Task-Oriented TLB					5.19	10, 123	< .001	.30
Constant	-1.00	2.76		-0.36			.72	
Supervisor Rating	0.28	.05	**.41**	5.16			**< .001**	
Gender	0.24	.12	**.17**	2.06			**.04**	
Age	0.01	.01	.08	0.98			.33	
Education	-0.04	.04	-.08	-0.89			.37	
Working Hours	-0.01	.01	-.15	-1.60			.11	
Relationship Status	0.08	.15	.04	0.52			.60	
Current Position	-0.04	.06	-.06	-0.64			.52	
Number of Children	0.05	.06	.08	0.87			.39	
Subordinates	0.00	.00	.09	1.13			.26	
Age of Leader	-0.01	.01	-.11	-1.27			.21	
Relation-Oriented TLB					2.96	10, 123	.002	.19
Constant	1.00	2.63		0.38			.70	
Supervisor Rating	0.25	.05	**.42**	4.96			**< .001**	
Gender	0.19	.11	.15	1.69			.09	
Age	0.01	.00	.11	1.20			.23	
Education	0.02	.04	.04	0.37			.71	
Working Hours	-0.00	.01	-.03	-0.28			.78	
Relationship Status	-0.00	.14	-.00	-0.01			.99	
Current Position	0.02	.06	.03	0.26			.80	
Number of Children	-0.00	.06	-.00	-0.01			.99	
Subordinates	0.00	.00	.01	0.10			.92	
Age of Leader	0.01	.01	.05	0.57			.57	

Table 3: Prediction of Change in Transformational Leadership Behaviours of Employees (continues)

Change-Oriented TLB					4.19	10, 122	< .001	.26
Constant	-0.40	2.58		-0.15			.88	
Supervisor Rating	0.24	.05	**.39**	4.76			**< .001**	
Gender	0.28	.11	**.21**	2.48			**.01**	
Age	0.01	.00	.15	1.71			.09	
Education	-0.05	.04	-.10	-1.07			.29	
Working Hours	-0.01	.01	**-.20**	-2.11			**.04**	
Relationship Status	0.03	.14	.02	0.25			.81	
Current Position	0.02	.06	.03	0.34			.74	
Number of Children	-0.05	.06	-.09	0.96			.34	
Subordinates	0.00	.00	.09	1.04			.30	
Age of Leader	-0.00	.01	-.05	-1.54			.59	
External-Oriented TLB					2.50	10, 122	< .01	.17
Constant	0.20	2.87		0.07			.95	
Supervisor Rating	0.17	.06	**.26**	3.04			**.003**	
Gender	0.06	.12	.04	0.47			.64	
Age	0.00	.01	.08	0.85			.40	
Education	-0.03	.05	-.06	-0.63			.53	
Working Hours	-0.01	.01	-.10	-0.99			.32	
Relationship Status	0.10	.15	.06	0.65			.51	
Current Position	-0.06	.06	-.10	-0.98			.33	
Number of Children	0.02	.06	.04	0.38			.70	
Subordinates	0.00	.00	.07	0.83			.42	
Age of Leader	-0.02	.01	-.16	-1.80			.07	

Note. n for all 132 or 133. TLB = Transformational Leadership Behaviour, PRC = Parental Role Commitment. Statistically significant predictors and β values shown in bold.

uation to be more critical than observers' assessment (Posner, 2016). We interpret the high levels of perceived improvement in relations-oriented TLB as being due to generally increased orientation of leaders towards others (Dahl et al., 2012). On the other hand, a low level of perceived improvement of external-oriented TLB should have its cause in reduced time availability and attention, focus shift and a willingness to spend time for extra-professional affairs (Stellner, 2021). In sum, a key contribution of this study is that employees, compared to leaders, seem to perceive TLB changes similarly in terms of direction but not terms of magnitude. This notion requires work-family enrichment theory to add the perspective of stakeholder perception. If stakeholders perceive enrichment unequally, differences need to be explained and put into relation. Scholars could consider interpreting enrichment not as an objectively measurable parameter, but rather depending on the observer.

The regression analysis revealed a potential weakness of this and previous research (Stellner, 2021). Females rate in a less pronounced manner towards improvement, while males could evaluate with an empathy-based gender bias. Nevertheless, we refrain from rejecting hypotheses 1 to 5, as males also form part of employees and we are specifically investigating perception. Yet, the finding indicates that perceived leadership performance (change) highly depends on the background of the affected persons. Again, the consideration of stakeholders' perspective is needed in future theoretical models.

We also found that among employees, overall ratings of their supervisors was a strong predictor of change in aggregated TLB, and among all clustered behaviours. Acknowledging that this comes with a certain bias, as we deem it unlikely that a supervisor receives a poor overall rating first and an excellent rating of behavioural improvement with fatherhood afterwards, we may still reason that fatherhood does not stand in the way of good overall performance.

We contribute to managerial practice in various ways and agree with McClean et al. (2021) that companies need

Table 4: Perceived Changes in Transformational Leadership Behaviour Employees – Gender Separation

Variable		Male (*n* = 76-82)	*p*	Female (*n* = 52-57)	*p*
Aggregated TLB		2.63	< .001***	2.75	.006**
Task-Oriented TLB		2.64	< .001***	2.80	.08
	Planning	2.62	< .001***	2.74	.07
	Clarifying	2.62	< .001***	2.76	.07
	Monitoring	2.65	< .001***	2.79	.13
	Problem Solving	2.63	< .001***	2.86	.28
Relations-Oriented TLB		2.43	< .001***	2.57	< .001***
	Supporting	2.17	< .001***	2.21	< .001***
	Recognising	2.43	< .001***	2.48	< .001***
	Developing	2.65	< .001***	2.75	*.05
	Empowering	2.49	< .001***	2.75	*.04
Change-Oriented TLB		2.65	< .001***	2.79	*.04
	Advocating Change	2.65	< .001***	2.77	.10
	Envisioning Change	2.68	.003**	2.89	.40
	Encouraging Innovation	2.61	< .001***	2.62	.001**
	Facilitating Collective Learning	2.64	< .001***	2.82	.21
External-Oriented TLB		2.89	.08	2.88	.16
	Networking	3.21	.08	2.98	.95
	External Monitoring	2.85	.11	2.92	.50
	Representing	2.60	< .001***	2.70	.06

Note. * p < .05, ** p < .01, *** p < .001. TLB = Transformational Leadership Behaviour. Lower values indicate improvement, higher responses indicate worsening. Wilcoxon signed rank tests used to determine significant differences from 3 ("unchanged").

to consider both workplace and home factors. First, companies should be aware of the potential conflicts, enrichment and resulting net effects of fatherhood on leaders. In most cases an improvement of TLB can be anticipated. Second, all parties involved should be prepared for the expected changes with sufficient lead time. Expectant fathers especially should receive coaching and support during this transition phase. Third, organisational measures like paternity leave, day-care and extra days off, which are already standard procedures when women become mothers, should also be consistently established for men. The policy of "returning to normal after two weeks" to avoid the negative effects of fatherhood on business may seem convenient and less complex, but ignores the reality.

7.2 Limitations

This study comes with several limitations. First, change in the behavioural patterns of individuals should ideally be studied using a longitudinal research design. Male managers and their behaviour should be tracked over years to grasp behavioural changes and their root causes. Our study, however, followed the approach of asking about perceptions of change to compensate for this lack of data, at the risk of biasing memories and perceptions. Second, we observed a significant gender difference with regard to perception of TLB change of leaders. This could partially also be explained by our research design which might attract participants who are also fathers and leaders. As a result, they could project their own aspirations onto their superior. The fact that our sample is 59% male increases the issue of bias and pulls perception of TLB more strongly towards improvement. Third, we draw a comparison with our previous study (Stellner, 2021). The evaluated leaders of the present study do not correspond 1:1 with the former ones. We deem this a minor problem. Nevertheless, it would have been beneficial to evaluate a fixed set of leaders from multiple perspectives. Fourth, as more than 60% of respondents held an academic degree, we need to regard our sample as over-educated. Additionally, more than 60% of participants were in a management position.

This indicates that managers are considerably overrepresented in the sample. Fifth, spontaneous rating of a leader with a 5-star rating system is a strong simplification, unidimensional, and covers subjective moods. Employees could tend to penalise or reward their leader for their general performance or grace when asked about changes in TLB with fatherhood. We believe that we avoided this issue in the best possible way by cascading survey questions. Nevertheless, there remains the issue that participants might feel bound by their absolute rating of an individual even when evaluating only change of behaviours.

7.3 Outlook

We suggest work-family enrichment theory to add the perspective of stakeholder perception, as there is ample evidence that enrichment is a group-specific phenomenon. In addition, work–family enrichment research finally needs studies with a longitudinal design. This gap should best be filled by cooperating with social security institutions or larger companies that have big sets of data covering both aspects of demography and evaluation of leaders over time. We encourage scholars to follow our approach to measure TLB with the taxonomy of Yukl and further develop this concept. This would simplify comparison of future results. Besides that, future studies should put fatherhood into a broader context with other factors that are known to shape leadership behaviours, such as professional experience, personal values, company background and type of work. Bearing in mind similarity attraction theory, research should test if gender in combination with having children influences perceptions of TLB. We would have needed a larger sample to do so in the present study. Finally, as already proposed (Stellner, 2021), we emphasise that leadership research should understand fatherhood in its social rather than biological meaning. Therefore, there is a need to investigate whether other paternal roles (adoption, mentoring, coaching) have similar effects on TLB at work.

7.4 Conclusion

Our study is a further confirmation of work–family enrichment theory. We show that perceptions of task-oriented, relations-oriented and change-oriented TLB change from the employees' perspective. Besides, we add further understanding on the differences in perception between employees and leaders. Moreover, we found a variance in perception between males and females of change in TLB, a still untouched phenomenon in work–family research. Therefore, we propose that future research around work-family enrichment puts an emphasis on the perspective of different stakeholders.

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Vpliv starševske izkušnje na transformacijsko vodstveno vedenje: Analiza spremembe odnosa med družino in delom pri moških menedžerjih z vidika zaposlenih

Ozadje: Ko moški vodja postane oče, pride do sprememb v njegovem transformacijskem vodstvenem vedenju zaradi spremenjenih prioritet, pričakovanih vlog in prenosa virov med domenami. Raziskave obogatitve poklicnega in zasebnega življenja priznavajo pozitivne splošne učinke očetovstva na splošno transformacijsko vodstveno vedenje. Naša kvantitativna študija prispeva k obstoječemu znanju z analizo dojemanja vedenjskih sprememb vodij z vidika zaposlenih. Rezultati se ujemajo s prejšnjimi študijami za oceno razlik v dojemanju med vodji in zaposlenimi.
Metode: Raziskava izhaja iz natančne, podrobne definicije transformacijskega vodenja. Na podlagi podatkov, zbranih od vzorca 139 anketirancev, testiramo pozitivne učinke očetovstva na vodstveno uspešnost s Wilcoxonovim testom predznačenih rangov.
Rezultati: 13 od 15 transformacijskih vodstvenih vedenj se znatno izboljša z očetovstvom. Ugotavljamo, da vodje in zaposleni različno gledajo na spremembe. Zaposleni podobno zaznavajo izboljšanje v smislu smeri, vendar je manj izrazito glede na obseg. Poleg tega ugotavljamo, da imajo dobro ocenjeni vodje največ koristi od očetovstva, vsaj z vidika svojih zaposlenih. Moški zaznavajo višje stopnje izboljšanja kot ženske, kar pripisujemo pristranskosti empatije med spoloma.
Zaključek: Naša študija potrjuje teorijo obogatitve med delom in družino in pozitivne učinke očetovstva na transformacijsko vodstveno vedenje. Kljub temu pokažemo, da vse vpletene strani ne dojemajo vedenjskih sprememb skladno.

Ključne besede: *Vlog, Obogatitev povezave delom in družino, Starševstvo, Očetovstvo, Transformacijsko vodstveno vedenje*

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Make it their Decisions, not your Directives: Exploring Required Green Competencies for Employee Ecological Behaviour

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Background and Purpose: A growing body of evidence confirms that employee ecological behaviour (EEB) is the most critical factor indicating organisational competitive advantage and environmental performance. The present study identifies and explores the green competencies required at the workplace to perform ecological behaviour. No prior study has explored the required green competencies from employees at the workplace in higher education institutions to the researchers' knowledge.
Design/Methodology/Approach: The research utilises the data generated from eighteen comprehensive interviews with the top five Malaysian green universities' employees. The study adopted the content analysis approach to explore contextually relevant competencies required for EEB in the workplace.
Results: Six main green competencies, namely environmental awareness, environmental attitude, environmental knowledge, environmental consciousness, green mindfulness, and green ability, were generated from the analysis supporting ecological behaviour at the workplace.
Conclusion: This research explored the required green competencies of employees to be environmental-friendly in the workplace by investigating the previously neglected domain required in the workplace. The research offers practical implications to universities and human resources (HR) to adopt accountabilities for an organisation to be environmentally sustainable. The recruitment committee and top management of higher education institutions should accentuate an environmental stance and green competencies in job descriptions to entice applicants with an environment-friendly mentality.

Keywords: *Green competencies, Employee ecological behaviour, Higher education institutions, Green universities, Employee green behaviour*

1 Introduction

The belief that income-oriented activities lead businesses is swiftly evolving. Human and organisation activities, including fossil fuel burning, carbon monoxide emissions and deforestation, are the culprits behind distressing environmental scenarios. Various organisations are attempting to implement diverse environmental approaches by implementing green strategies or environmental management systems to address the crisis (Fawehinmi et al., 2020). These strategies involve reducing carbon emissions by decreasing office materials and electricity utilisation and correctly recycling waste materials to make beneficial products. Nevertheless, acknowledging and shaping individual behaviour is necessary to minimise the negative environmental impacts of organisational activities and

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emphasise a sustainable environment to adopt strategies excellently (Anwar et al., 2020). Environmental sustainability has a crucial role in higher education institutions due to the direct and indirect ecological implications involving electricity consumption, waste production, material usage, large movements of people and transportation within a campus (Farooq et al., 2021). Universities contribute less to pollution than the corporate sector. Nonetheless, universities play a critical role in environmental research and awareness. They are responsible for teaching the present and upcoming generations the significance of EEB (Fawehinmi et al., 2020).

As employees are the primary players in the higher institution sectors, achieving university sustainability is practically attainable via their participation (Fawehinmi et al., 2020). Malaysia faces significant environmental challenges as a developing country. For instance, the nation's carbon dioxide (CO2) emissions are increasing by more than 6% each year, comparable to China's 7.42% yearly growth rate (Anwar et al., 2020). Research universities in Malaysia have been given the task of self-generating revenue and forming holding corporations to run business initiatives based on the commercialisation of their study products (Sheriff & Abdullah, 2017). Besides, these universities are anticipated to expand their intellectual abilities and serve as mentors for other organisations engaged in knowledge enhancement studies. Universities must ensure sufficient skilled and technical experts to face the problems. Various institutions have endeavoured to invent innovative approaches to manage and improve competence to address current research and development difficulties by considering this (Barth et al., 2007). Therefore, a competency framework for personnel quality attributes has emerged as a popular technique for companies looking to assess and increase their employees' skills (Getha-Taylor, 2008)

Numerous research offered several competency frameworks to aid corporations in improving the abilities of their personnel (Wu, 2009). A competency model contains a list of necessary skills. Nevertheless, not all needed skills are equally significant. Recognising the disparities in acknowledged competency levels among high-achievers and others is critical to properly conduct skills development (Lee, 2010). The required green competencies could be condensed into a limited quantity of crucial competencies. Vital competency applications for academicians can be devised and established once the required competencies are determined. Thus, this paper explored the required green competencies for performing ecological behaviour in the workplace among academicians from the top five Malaysian green universities.

Employee ecological behaviour (EEB) encompasses various activities, including recycling (e.g., reusing paper, plastic, glass, and containers), water conservation (e.g., limited water usage when showering or washing hands), electricity conservation (e.g., switching off lights when not used), reusing (e.g., disposable cups), taking public transportation, cycling, walking, correctly disposing of non-recyclable waste, utilising lesser paper when printing (e.g., double-sided printing), and purchasing or using green products (Bissing-Olson et al., 2016). Adopting EEB can bring numerous benefits, such as environmental performance (Anwar et al., 2020), social sustainability (Amrutha & Geetha, 2020), job satisfaction (Kim et al., 2019b), employee task performance (He et al., 2020), self-esteem and well-being (Zhang et al., 2021).

The primary objective of the current study is to explore the required green competencies for EEB at the workplace, specifically in the Malaysian green universities context. The research tackled explicitly two research questions from employees' perspectives:

(1) What are the green competencies of academics from Malaysia's top five green universities?

(2) How do these green competencies help academics become more eco-friendly?

In light of its primary motives, this research concentrated on a sustainable green environment as a significant contributor to environmental sustainability from the employees' viewpoint. Thus, the originality of the present research is focused on attaining primary aims in the areas discussed subsequently.

1.1 Need for the Study

Studies on environmental-friendly behaviour in the workplace (e.g., Ramus & Steger, 2000; Pinzone et al., 2016) have traditionally observed this behaviour as a voluntary act and defined it as "individual and discretionary social behaviours that are not explicitly recognised by the formal reward system that contribute to a more effective environmental management by organisations" (Boiral & Baron, 2009, p. 233). Norton et al. (2017) differentiated between necessary behaviour that adds to key business goals and optional behaviour contributing to the organisational, social, and psychological environment supporting task performance. EEB is defined as needed ecological behaviour conducted within the context of an employee's required job obligations in this study (Fawehinmi et al., 2020; Norton et al., 2017). EEB includes following organisational regulations, modifying work approaches, selecting responsible alternatives, and developing workplace sustainable goods and procedures.

Previous EEB studies have focused on green human resources management (GHRM) practices to foster eco-friendly behaviour (Anwar et al., 2020), organisational strategies and the role of sustainable advocate (Lasrado & Zakaria, 2019), organisational climate (Tsai, 2018) and outcomes of EEB such as job satisfaction (Kim et al., 2019b) and environmental performance (Anwar et al., 2020). Unfortunately, only limited studies explored

the role of green competencies. Cabral and Lochan Dhar (2019) developed a scale measuring green competencies. Cabral and Jabbour (2020) revealed the mediating effect of environmental training on green competencies and proactive environmental management maturity. Subramanian et al. (2016) investigated the impact of individual green competencies on organisations' green practices and performance goals. However, to the researchers' knowledge, no study has explored the required green competencies for EEB.

The literature focused on competency development among employees at the workplace. For example, Sabuncu and Karacay (2016) assessed professional competencies required for talent management, while Lee (2010) explored competencies for high performers. Wu (2009) studies core competencies for research and development technical professionals, while Phelan and Sharpley (2012) investigated entrepreneurial core competencies and skills. Additionally, Wang and Ha-Brookshire (2018) researched digital competencies required for the anticipated Industry 4.0. Nevertheless, the exploration of required green competencies among employees for performing ecological behaviour remains scarce. This study is the first to explore employees' required green competencies at the workplace based on the top five Malaysian green universities.

Subramanian et al. (2016) proposed that HR managers discover new personnel with green skills and develop appropriate environmental training that benefits current employees. Determining techniques for acquiring the necessary information for sustainability practices and assessing initiatives for obtaining the necessary green competencies could be essential research directions in the future (Chams & García-Blandón, 2019). The study developed a framework to help organisations focus on employees' green competencies for better environmental management.

According to Cardy and Selvarajan (2006), technical and behavioural competencies are two types of competencies found at the employee level. Technical competencies denote occupation-related abilities and knowledge, whereas behavioural competencies imply individual attributes or traits. Competency models are required before implementing behavioural skills (Lee, 2010). A competency model is a collection of success criteria covering the critical behaviours required to thrive in a specific role (Schoonover et al., 2000). Additionally, the competency model could be utilised to determine the necessary competencies people require to enhance their current or future performance. Specifically, employees' competencies could be contrasted to a suitable model to identify competency gaps (Lee, 2010).

The current study is divided into six parts. The second section briefly explains green competencies. The following section elaborates on the methodology adopted in this study in-depth. The results are presented in section four, which discusses the data analysis and comprehensively explains the study's findings. Section five discusses the study findings, implications, limitations and future research direction. The final section comprises the conclusion.

2 Green Competencies

Green competencies are the environmental knowledge, abilities, and other socioeconomic behaviours that make a person more likely to behave and act in a way that benefits the general well-being of the environment (Subramanian et al., 2016). According to Steele (1980), green competencies are individuals' abilities to engage with their immediate environment positively and enthusiastically. In addition, Steele (1980) continued that humans needed three elements to engage with their natural surroundings. First, an individual must be conscious of environmental crises and desire to safeguard the environment. Thus, their daily life activities should contribute the least to environmental damage. Second, people must understand the fundamental principles of the environment. Finally, they must retain environmental conservation abilities like decreasing waste and emissions. According to Pedersen (1999), green competencies include:

(1) Resource preservation, practice abilities, and outdoor skills as part of environmental skills

(2) Conscientiousness as a part of a person's characteristics, style, and consciousness

(3) Knowledge as a means of seeking and enhancing environmental knowledge

Subramanian et al. (2016) differentiated natural green competencies (NGC) and acquired green competencies (AGC). The effective green competency (EGC) combines NGC and AGC and impacts green performance. According to Roberts' (1997) competencies framework, NGC is regarded as fundamental features gained from individual observations, while AGC is referred to as environmental knowledge and expertise acquired via experiences. The findings showed that AGC is a better predictor of sustainability performance than NGC and has a more significant impact on environmental behaviour. Thus, HR managers may emphasise assessing employees with AGC and providing green seminars and training to help them build AGC to speed up sustainable advancement (Subramanian et al., 2016).

According to Qu et al. (2021), green core competency has a positive and substantial impact on green innovation performance, while green absorptive ability moderates the association connecting green core competencies and green innovation performance. Corral-Verdugo (2002) elaborated on green competencies as a higher-order dispositional variable that includes environmental perceptions, motivations, and behaviours. Empirical data were used to verify the validity. Green competencies were described as efficient answers, green motives, perspectives, and attitudes significant for environmental conservation.

According to Fraijo-Sing et al. (2010), green compe-

tencies comprise two main aspects: environmental knowledge and skills, which must be applied to comply with society's ecology requirements. Researchers of previous studies widely discussed green behaviour as a dimension of green competencies(Subramanian et al., 2016; Cabral & Lochan Dhar, 2019; Cabral & Jabbour, 2020). For example, Subramanian et al. (2016) highlighted that green competencies comprise environmental consciousness, knowledge, skills, and awareness of the environment. Cabral and Lochan Dhar (2019) constructed a scale for measuring green competencies and concluded that competencies encompass green abilities, attitudes, awareness, behaviour, knowledge, and skills. Conversely, Pinzone et al. (2016) explored the role of green competencies building practices on organisational citizenship behaviour and the impact on environmental performance (Anwar et al., 2020).

3 Method

Qualitative research can shed light on the "why" behind environmental behaviour by probing the motivations, beliefs, and attitudes that underpin it (He et al., 2020). The researchers utilised the qualitative approach to comprehensively assess the green competencies of academics for ecological behaviour at Malaysian green universities in this study. Using a qualitative research design allows t=an explanation of the "how" question to better explain the findings of the "what" question in more detail, especially in discussing new issues such as green competencies in the organisation (He et al., 2020). Although other methodological approaches are suggested, using qualitative methodology in this study does not limit its significance to knowledge development. Employing a qualitative research methodology contributes to overcoming the weaknesses of HRM research as researchers have proposed, particularly on the weak capability of the research data to explain the observed findings (Elo & Kyngäs, 2008; Graneheim et al., 2017). Qualitative research approaches include action studies, case studies, content analysis, grounded theory, historical studies and in-depth interviews.

The content analysis approach was adopted in this study to explore contextually relevant competencies required for EEB at the workplace in a novel context, notably Malaysia. A content analysis was used to analyse the interview data. This approach is deemed suitable to analyse and interpret the interview data for this study to describe and understand the phenomenon of green competencies in the green universities of Malaysia, especially when the topic is still under-researched. Content analysis allows a focus to be given on the subject and context of the study (Graneheim et al., 2017). This focus may allow the variation of responses to be determined and linked to a particular green competency phenomenon.

The use of previous understanding of competencies from the literature is acted as a guideline for 'theory building' rather than 'theory testing'. This is particularly true for the green competencies topic as it is still under-researched. As a theory-building mechanism, the findings of this study have not been pre-determined but emerged from the interview data. This step is essential to make sense of the information from respondents after the data were gathered (Charmaz, 2007). Without a guideline or theory, researchers may be unable to sensibly integrate their findings into a theoretical stance, exposing the data to personal biases, especially for novice researchers (Gioia et al., 2012). This does not limit the exploratory nature of the research because new knowledge can be developed by extending and challenging the existing knowledge to yield novel insights from the current research findings (Charmaz, 2007).

3.1 Data Collection

The data gathering procedure was divided into two parts. First, the Universitas Indonesia (UI) GreenMetric website ranking was analysed in-depth. Ecological settings and infrastructure, energy and climate change, waste, water, and transportation were all factors in the UI GreenMetric World University Rankings. The factors were ascertained according to information reported by the respective universities that demonstrated a pledge to greening the environment and operating sustainably (Marrone et al., 2018). The UI Green Metric is the world's first university sustainability ranking. This ranking system seeks to assist the sustainability of university campuses by championing university-led social changes in response to sustainability objectives, serving as a self-assessment tool, and advising governments, domestic and international environmental organisations, and society on green campus initiatives (Marrone et al., 2018). This approach is currently one of the most widely used and applied instruments for assessing the sustainability of university campuses (Suwartha & Sari, 2013).

From the UI GreenMetric, the top five green universities were selected based on the purposive sampling technique, namely universities from Malaysia. The selection criteria of the green universities were UI GreenMetric rankings involved gathering basic information on university size and its zoning profile, setting and infrastructure (15%), energy and climate change (21%), waste (18%), water (10%), transportation (18%), and education and research (18%) (UI GreenMetric, 2018). Subsequently, the green initiatives were studied from information available on the respective university's websites. The semi-structured interview protocol, which contains open-ended queries, was designed using data acquired from websites and other internet sources. Many qualitative and inductive studies rely on the progress of the interview protocol concerning the realities of field study (Charmaz, 2007). The ethical committee of Universiti Malaysia Terengganu approved and granted the researchers permission to pursue

the study. Ethical approval was obtained beforehand.

First, interviews were undertaken to gauge in-depth the ecological behaviour of academics from the five green universities. Potential participants were selected using convenience sampling. (Emerson, 2015). Academics were chosen based on their knowledge of the sustainable practices of the development process in universities (Fawehinmi et al., 2020). Participants were notified about the scope of their involvement before taking part in the research. They were required to sign a consent form in compliance with the universities' existing ethics committee standards. A semi-structured interview protocol was distributed before the scheduled date. The interviews took 30 to 60 minutes and were undertaken face-to-face between February and August 2020. The data collected were audio-recorded and stored in electronic format. Recorded interviews were transcribed using a Microsoft Word file.

Table 1: Characteristics of participants

University	Participants	Gender		Academic Qualification	
		Male	Female	Master	PhD
A	4	3	1	1	3
B	3	2	1	1	2
C	3	2	1	1	2
D	5	2	3	1	4
E	3	1	2	1	2
Total	18	10	8	5	13

3.2 Participants

Semi-structured interviews were carried out with eighteen participants. Table 1 presents the participants' characteristics.

3.3 Data Analysis

Content analysis is used in this study to allow researchers to make sense of the interview data by replicating and interpreting it to the study's context (Elo & Kyngäs, 2008). In this study, content analysis was used to provide condensed and comprehensive descriptions of green competencies among academics in the green universities of Malaysia and their influences on their eco-friendly behaviour. Because there is scarce information about green competencies discussed in previous studies, inductive content analysis was appropriate as the findings of this study are data-driven. The analysis consisted of three processes: preparation, organising and reporting (Elo & Kyngäs, 2008).

First, the preparation process involves identifying units of analysis based on the research questions. The study attempted to answer two research questions: (1) What are the green competencies of academics from the top five green universities of Malaysia? and (2) How do these green competencies help academics be more eco-friendly? Thus, the unit of analysis was based on the interview protocols. This was likely the most suitable unit of analysis to provide the manifest content sufficient for the following analysis process (Graneheim et al., 2017). Although further progress of the interview largely depends on each informant's feedback, having an interview protocol provides guidelines for a researcher to conduct the interview and avoid personal biases (Gioia et al., 2012).

Second, the interview data were organised according to the category. This organisation involved listening to the audio recorded and reading through field notes before the transcripts were completed. The data were then categorised based on the similarities and variations. At the beginning of this process, initial categories were generated freely before it was reduced to a meaningful theme by merging a similar group of data under the same category. This allows the data to be interpreted based on its belonging.

Lastly, data reporting occurred when final themes were developed based on the underlying concepts related to the topic of green competencies and employee ecological behaviour.

Table 2: Analysis

Themes	Statements
Green Attitude	*The attitude, of course. Even though you have the awareness, if you don't want to be responsible, of course, you will not do it.* (Respondent 7, University C)
	[…] I think it is not only in the technical part, but attitude, as in how to encourage attitude which is concerned about environmental sustainability. (Respondent 9, University D)
	I think ecological behaviour relates to our attitude. As employees, we have our workplace. So, it is about how we interact with our work surroundings. It is about how we interact with our students in the classrooms and with other faculties (Respondent 8, University B)
Environmental Consciousness	*Consciousness has to exist; then, we will take actions.* (Respondent 11, University D)
	[…] In terms of green buildings that focus on safety and green-conscious community living on the campus. The meaning of green not only applies to plants, but it is about what the real meaning of green is. (Respondent 10, University C)
	Being energy-friendly or environmental-friendly firstly depends on our level of environmental consciousness. That's what I understand about ecological practices. (Respondent 12, University B)
	I think with Respondent 3, what is important is consciousness. We might be able to do that. It is also related to discipline. If you don't have a consciousness or discipline, you might not be able to do those things. (Respondent 18, University B)
Green Knowledge	*I think having enough knowledge is very important.* (Respondent 3, University B)
	Because of their background, those in the science field will be more exposed to green practices. (Respondent 2, University C)
	As a teacher, what we can do is give them the knowledge, like throwing the rubbish properly. We don't know where to throw the oil, that's why in the syllabus we teach students where and how we can throw the oil […] (Respondent 5, University D)
	As long as people are not aware that they are in danger, they will never feel the effects […](Respondent 16, University A)
Green Ability	*if we want to do green practices, it is not necessary to use those materials that are recyclable, but green practices in the sense of sustaining the capacity and avoiding overcapacity.* (Respondent 18, University A)
	We have one professor who is a professor in sustainable waste management. So we actually have quite a lot of expertise in sustainability […]. (Respondent 14, University E)
	[…] We are more towards recycling, although we have expertise on water. But we are working together with […]. Being a Lestari, we are multi-disciplinary. We are partnering with different groups. (Respondent 13, University A)
Green Mindfulness	*To make people adopt green practices, the first thing we need to do is have the concept in their minds. We must put the concept in the minds of students and staff by posting everything about green practices on the campus. They need to know that we need to implement green practices such as recycling […].* (Respondent 15, University A)
	To me, it is more about our mindset, clean from any pollution. We think that's green enough, but people outside are not seeing it like that […]. (Respondent 17, University D)
	I do them because I am mindful of my responsibility as a human being. I do them not just at work, but it is my habit in life. When I switch on the lights, I will turn them off when not using them. I will also do the same at home […]. (Respondent 6, University E)
Green Awareness	*I think the awareness. I'm not sure whether it is because of the level of my knowledge or the level of my education. I'm not sure, but my awareness of the environment is there.* (Respondent 11, University D)
	[…] one is awareness and conservation. Before that, understanding should come first. If we don't understand, we don't bother; we don't want to practice. (Respondent 12, University E)
	Awareness of moral value […]Because you want to do good things, I'm sure you will not be wasting because if you waste, for example, not turning off the light when leaving the office, you will feel guilty. (Respondent 9, University E)

4 Results

The content analysis revealed seven competencies for supporting ecological behaviour in the workplace. Table 2 displays the themes that emerged from the content analysis.

5 Discussion

This research sheds light on the advancement of required green skills, a relatively new research area in employee environmental behaviour. Although most previous studies focus on the application of EEB in the corporate world, a research gap is prevalent in understanding the development of required green competencies of EEB in higher education institutions, particularly in Malaysia. This research adds to the literature on sustainable higher education by providing insight into types of green initiatives and competencies implemented in the university context to enhance environmental behaviour by concentrating on human resource practices, an underexplored area, from a relational perspective. Academics and practitioners will be interested in the research findings. Academics and practitioners will be interested in the research findings. The six themes that emerged from the analysis were utilised below to formalise and discuss the results as key green required competencies for EEB.

Participants of interviews emphasise the critical role of environmental attitude, which is perceived mainly as the barrier to implementation of EEB. Environmental attitude is described as an individual's proclivity to care for the natural surroundings (Bamberg & Möser, 2007), and it is linked to pro-environmental workplace practices (Bissing-Olson et al., 2016). According to the Theory of Planned Behaviour (Ajzen, 1991), attitudes determine behaviour. The studies based on this notion asserted that individuals who care about the environment are inclined to take steps to safeguard it (Blok et al., 2014).

Furthermore, studies have found that having a pro-environmental mindset correlates with having a pro-environmental attitude (Bamberg & Möser, 2007). Some evidence proved that a pro-environmental attitude could anticipate pro-environmental behaviour generally and particularly in workplaces. Managers' views towards pollution control were positively associated with their desire to participate in pollution prevention practices, as per Cordano and Frieze (2000). Farooq et al. (2021) found employees' environmental attitude has a considerable impact on employees' pro-environmental behaviours, and the results are consistent with Safari et al. (2018).

Findings also reveal the tendency of environmental consciousness among employees for performing EEB in the workplace. Environmental consciousness is recognised as a psychological factor that influences people's pro-environmental behaviour and consists of multifaceted constructs that influence people's attitudes, actions, behaviours, knowledge and intentions (Mishal, 2017). According to Sharma and Bansal (2013), environmental consciousness implies psychological elements that influence people's willingness to participate in pro-environmental conduct as a belief system component. Farooq et. (2022) stated that environmental consciousness significantly shaped employee pro-environmental behaviours. Kautish et al. (2019) noted that environmental consciousness and recycling intents substantially affected green purchasing behaviour compared to consumers' perceived effectiveness and readiness to be ecologically responsible. Results are consistent with Kautish et al. (2019) and Yusliza et al., 2021).

In terms of workplace ecological behaviour, participants revealed the importance of the environmental knowledge of an individual. Environmental knowledge refers to a person's understanding of human relationships, environmental challenges, and the interconnectedness of ecological systems (Burchett, 2015). The knowledge could include the abilities required to resolve negative impacts on ecosystems, resulting in pro-environmental initiatives. According to Levy and Marans (2012), pro-environmental behaviours are influenced by understanding concerns and mitigation strategies. As per the literature, green knowledge is vital in influencing the behaviour of university students in developing and emerging countries to be environmentally concerned (Vicente-Molina et al., 2013). Ecological education provides students with the discussed environmental capacity (Zsóka et al., 2013). The results of our research are similar to the previous findings of Fawehinmi et al., 2020). Green knowledge serves as a mediator between green activities and employees' environmental behaviour at work (Fawehinmi et al., 2020; Okumus et al., 2019).

Green abilities of employees also emerged as a major source to perform EEB in the workplace. Abilities refer to an innate capacity that facilitates learning and improves work performance (Goffin & Woycheshin, 2006). HRM strategies can strengthen employees' abilities, according to management literature. Green skills are a subset of green competencies that allow employees to improve their ability to undertake environmentally responsible tasks (Cabral & Lochan Dhar, 2019). Additionally, green abilities assist employees to grow and improve their performance to attain environmental conservation. This aspect is the most vital factor in achieving GHRM innovation in organisations (Rajiani et al., 2016). Cabral and Dhar (2019) discovered that green training positively impacts green abilities. Furthermore, Arulrajah et al. (2015) discussed the impact of green training on employees and developing green talents in the workplace, which leads to improved general environmental performance through environmentally friendly behaviour.

Furthermore, interviewees refer to the important aspect of the mindfulness of employees. Participants individuals with green mindfulness of environmental issues have more EEB. Green mindfulness includes individuals' more extensive environment awareness, openness to new information, multiple perspectives awareness, attentiveness to a unique environment, and wakefulness in the present (Langer & Moldoveanu, 2000). Organisational mindfulness concerning green management is crucial in the environmental age to encourage sustainable values within a firm (Chen et al., 2014). Heightened awareness and understanding of new information and the current surroundings characterise green mindfulness (Langer & Moldoveanu, 2000). Mindfulness efficiently contributes to good behaviour changes, especially in the setting of ecological well-being (Yusliza et al., 2021)

Employee environmental awareness is also reflected in the themes of interviews that contribute to EEB. Kollmuss and Agyeman (2002) described environmental awareness as "knowing the impact of human behaviour on the environment" (p. 253). They highlighted that several cognitive and emotional constraints limited environmental concerns. The non-immediacy of several environmental challenges, slow and steady environmental degradation and the intricacy of environmental concerns are cognitive constraints that could substantially impede a person's willingness to act ecologically. Emotional reactions and emotional non-involvement are examples of emotional limitations. Individuals' environmental awareness is predicted to improve as their ecological conduct advances (Yusliza et al., 2021). Green awareness has been studied in numerous contexts and has yielded similar impressive findings (He & Liu, 2018, Garcia et al., 2019).

5.1 Theoretical Implications

From a theoretical standpoint, this research adds to the literature by expanding the understanding of green management, a worldwide priority in recent years. Although an increasing number of academics have argued for the use of green policies to accomplish an organisation's environmental goals, scant research has been done on the green competencies needed for EEB at work. This research builds on previous studies on the idea of green abilities needed in the workplace for EEB. Regarding the relationship between green knowledge and EEB, strong environmental knowledge is desired for an EEB and guides environmental sustainability. The findings suggest that employees with a high level of environmental knowledge are more inclined to act in environmentally beneficial ways at the workplace. These results are supported by other studies (Okumus et al., 2019; Safari et al., 2018). Resultantly, choosing personnel with higher environmental awareness increases the likelihood of evaluating environmental risks to the firm and the general public and acting in an environmentally beneficial manner.

The present research results revealed that environmental awareness among academic staff gives them a feeling of shared objective towards the university's environmental goals and motivates them to work harder to meet those goals. Nevertheless, the results align with Saleem et al. (2020). Individuals who are conscious of the environment are more prone to participate in pro-environmental practices at work (Okumus et al., 2019). As per prior studies, employees who are well informed on ecological and environmental concerns are more willing to engage in green behaviours at work (Saleem et al., 2020). Employee behaviour to perform eco-friendly at the workplace depends on green ability. This study's results indicated that employees' ability to behave in an eco-friendly manner is a significant competency. Green capabilities refer to an employee's ability to encourage altruism, which is concerned with colleagues' well-being, and establish biospheres through demonstrating green behaviour in the workplace (Rajiani et al., 2016). Employees should be able to acknowledge and comprehend environmental issues while also attempting to mitigate adverse consequences (Anwar et al., 2020).

Green mindfulness evolved as contributing factor to ecological behaviour among academics of higher educational institutes at the workplace. Heightened awareness and understanding of new knowledge and the current surroundings characterise green mindfulness (Langer & Moldoveanu, 2000). Mindfulness has been shown to effectively contribute to good behaviour change, especially for environmental well-being (Yusliza et al., 2021). Chen et al. (2014) revealed the vital role of green mindfulness for employee green creativity which is critical to developing environmentalism. Environmental attitudes appear to positively impact EEB at the workplace and emerged as a significant competency required for EEB. Blok et al. (2014) revealed that employees with a green attitude have a firm intention to act for environmental protection. According to Merli et al.'s (2019) study on coastal tourism, coastal tourists have a better environmental attitude towards conserving coastal tourism sites by not using disposable articles but instead paying more for sustainable utensils. Scholars also discovered a positive effect of environmental attitude on EEB (Bissing-Olson et al., 2016; Blok et al., 2014).

The results denoted that environmental awareness seems to play a significant role in the development of EEB. Environmental consciousness is a way of connecting people to their surroundings and promoting environmental conservation. Employee awareness allowed them to create good environmental behaviours and motivated them to participate in EEB at work (Zareie & Navimipour, 2016). Farooq et al. (2022) discovered that environmental consciousness positively affects workplace environmental behaviour. Furthermore, the findings are consistent with prior research, showing that people with a high environ-

mental awareness are more ready to embrace environmentally responsible consumption habits (Alsmadi, 2007).

Green competencies were previously thought to be restricted to the corporate world (Cabral & Lochan Dhar, 2019). Therefore, this study adds to Malaysia's research on green competencies in higher education by adding to the body of knowledge on campus greening from a behavioural standpoint by exploring green competencies required to perform ecological behaviour in the workplace. The study findings add to the literature focusing on the employees' green competencies and signify the influence on the academic staff's EEB and the environmental performance of universities. Thus, this research also addressed the call for future research by Chams and García-Blandón (2019) to explore the required green competencies for performing ecological behaviour in the workplace. Moreover, this study extended the work of Anwar et al. (2020), which examined the impact of green competencies building practices on organisational citizenship behaviour towards the environment but did not explore the required green competencies to perform workplace ecological behaviour.

5.2 Practical Implications

Workplace and people management issues are often viewed as context-dependent and interdependent (Cooke, 2018). In particular, Employee Ecological Behaviour (EEB), which is treated as a distant issue for certain countries and organisations, requires a more contextual approach to investigate the topic to offer more localised ideas to solve the issue. Thus, the current study is relevant to fill the literature gap from international perspectives other than the Western world. The societal context of Malaysian green universities is indeed a good start to exploring the Malaysian context as they are likely to be a reference by other universities in the country (Anwar et al., 2020; Farooq et al., 2021).

The research findings offer university stakeholders evidence-based implications concerning the relative significance and contributions of various green abilities necessary at work for EEB. The findings will assist policymakers and universities with HR management strategies that help influence EEB at work for academic employees. Green hiring strategies can amplify a company's environmental commitment and green competencies in job descriptions of a university to entice applicants with an environmental perspective. Besides, training programmes for increasing green competencies are crucial because employees with environmental abilities are prone to participate in environmental performance (Cabral & Lochan Dhar, 2019). The research and development centre of universities and organisations can be more focused on green competencies to shape EEB in the workplace. Appreciating employees for positive environmental actions will encourage them to further support campus environmental activities. Human relationships with the system and natural environment are complicated and varied, akin to environmental challenges. Formal methods for reducing emissions, waste, and energy consumption do not encompass behaviours that might improve a university's environmental performance. The exploratory study on required green competencies provides a pathway for policymakers to focus on specific skills and attitudes towards EEB.

Subsequently, establishing a sustainability strategy and plan with particular environmental aims and targets applicable to all employees is essential. The strategy establishment requires HR department cooperation, as it is accountable for supplying employees with the necessary skills (Subramanian et al., 2016). Notably, GHRM practices particularly play a critical role in distributing green capabilities in organisations. This approach (Refer to Figure 1) gives HR departments clear instructions on improving long-term performance. The first stage is identifying and interviewing applicants concerned about environmental issues.

Furthermore, job descriptions must specify and explain the environmental tasks associated with a role, the skills, knowledge, and abilities. Candidates must complete the environmental activities indicated and interview requirements for organisations to identify and recruit the best talent. Employees' green knowledge, ability, understanding, and conscience should be retained, developed, and improved in the future by providing adequate training through green programmes. Furthermore, new employee green training is critical for improving their green competencies (Cabral & Lochan Dhar, 2019).

5.3 Limitations and Future Research

Future studies are possible because of this study's methodological and theoretical constraints. First, this study is a qualitative study that gathered data at a single point in time. Considering Malaysia as a non-Western country adds the significance of this study as scholars urged that more contextual dependent studies be conducted in exploring workplace issues (Cooke, 2018). Green competencies are skills and attitudes that may take time to increase or decrease over time. Future studies may use a longitudinal research strategy to examine the changes in green competencies with EEB at work to gain a comprehensive understanding. Second, other universities are adopting significant efforts to shift to a sustainable green campus. Thus, future research should consider other green institutions worldwide. Future research may adopt a mixed-method approach to look into the results of green competencies and EEB in the workplace. Relying solely on qualitative data derived from face-to-face interviews offers minimal insight into respondents' perceptions. A mixed-method approach could be adopted to undertake a comprehensive study in future studies. Based on content

analysis in this research, green competencies required at the workplace for EEB were explored. However, green competencies are not the only factors that shape employee behaviour at the workplace. Future studies should consider other organisational level factors, such as top management support (Farooq et al., 2021), green transformational leadership (Wang et al., 2018), and individual-level factors, including green self-efficacy (Fawehinmi et al., 2020), and green mindfulness (Farooq et al., 2021).

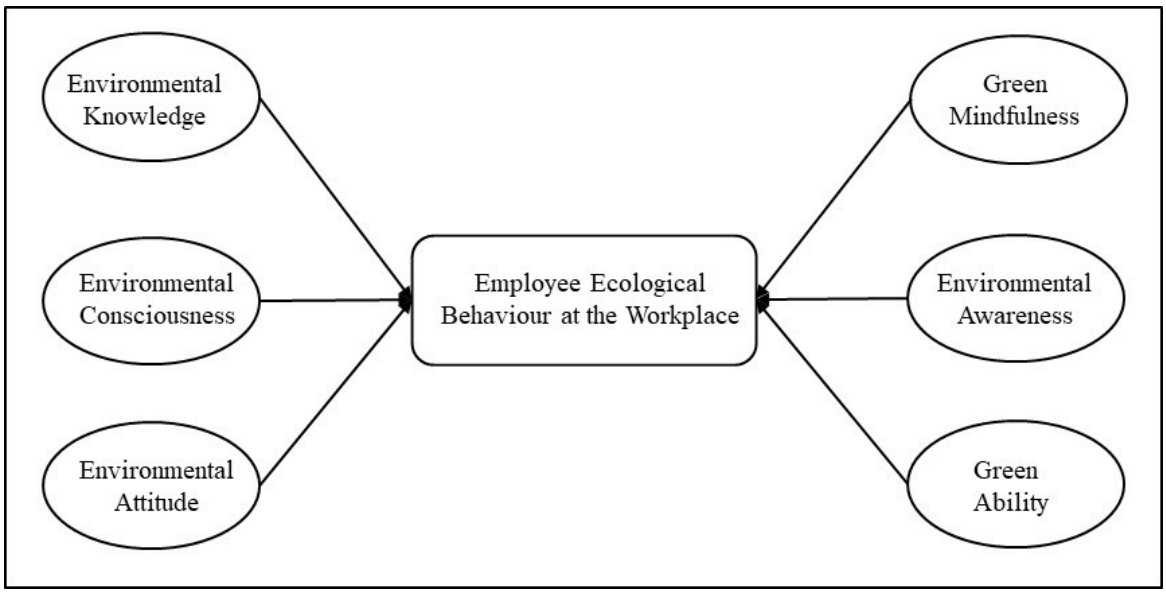

Figure 1: Framework of required green competencies for employee ecological behaviour

6 Conclusion

This research demonstrates that environmental knowledge, awareness, attitude, consciousness, ability, and mindfulness are required in employees to behave in environmental-friendly ways by investigating the previously neglected green competencies domain required at the workplace for EEB. We investigated green competencies among staff at Malaysian green universities using thematic analysis to perform EEB in the workplace. In line with ecological behaviour theories, our model supports the favourable influence of environmental knowledge, awareness, attitude, consciousness, ability, and mindfulness on EEB performance, which is still rare in Malaysian higher education (Farooq et al., 2022; Fawehinmi et al., 2020; Yusliza et al., 2021). We suggest that green competencies positively motivate employees to become involved in EEB in the workplace. Switching off electrical and electronic devices when not in use and reduced printing to minimise paper wastage are peculiar behaviours that employees develop formally through green competencies in the workplace. Our model promotes environmental sustainability among organisations by explaining that organisation specific green competencies and practices transform employee outlooks when provided with a supportive green climate, which, in turn, improves EEB at the workplace, strengthening organisational relationships with stakeholders and the society. Higher education institutions have learned that failing to consider human or behavioural variables in their environmental endeavours will result in ineffective environmental performance, as the realisation of increasing environmental responsibility has grown. However, a scarcity of research exists in guiding the effective implementation of environmental policies in universities using behavioural interventions. Ultimately, this research aimed to connect the HRM nodes and environmental management literature within green universities to explore the required green competencies for academic staff's ecological behaviour. As leaders in information creation, universities should be judged based on how much environmental awareness they generate and how devoted they are to fostering sustainable behaviour on their campuses. The findings offer policymakers guidelines to explore the green competencies that academic employees should possess.

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Naj bodo to njihove odločitve, ne vaše direktive: raziskava zahtevanih zelenih kompetenc za ekološko vedenje zaposlenih

Ozadje in namen: Vedno več je dokazov, da je ekološko vedenje zaposlenih (EEB) najbolj kritičen dejavnik, ki kaže na organizacijsko konkurenčno prednost in okoljsko uspešnost. Ta študija identificira in raziskuje zelene kompetence, potrebne na delovnem mestu za izvajanje ekološkega vedenja. Po našem najboljšem vedenju nobena predhodna študija ni raziskala zahtevanih zelenih kompetenc zaposlenih na delovnem mestu v visokošolskih zavodih.
Zasnova/metodologija/pristop: Raziskava uporablja podatke, pridobljene iz osemnajstih izčrpnih intervjujev s zaposlenimi na najboljših petih malezijskih zelenih univerzah. Študija uporablja pristop analize vsebine za raziskovanje kontekstualno pomembnih kompetenc, potrebnih za EEB na delovnem mestu.
Rezultati: Analiza rezultatov je identificirala šest glavnih zelenih kompetenc, ki podpirajo ekološko vedenje na delovnem mestu: okoljska zavest, odnos do okolja, okoljsko znanje, okoljska zavest, zelena pozornost in zelena sposobnost.
Zaključek: Ta raziskava je proučuje prej dokaj zanemarjeno področje zahtevanih zelenih kompetenc zaposlenih, da so okolju prijazni na delovnem mestu. Raziskava ponuja praktične napotke univerzam in zaposlovalcem, da prevzamejo odgovornost, da bo organizacija okoljsko trajnostna. Kadrovska komisija in najvišje vodstvo visokošolskih zavodov bi morala v opisih delovnih mest poudarjati okoljsko držo in zelene kompetence, da bi pritegnili kandidate z okolju prijazno miselnostjo.

Ključne besede: *Zelene kompetence, Ekološko vedenje zaposlenih, Visokošolske ustanove, Zelene univerze, Zeleno vedenje zaposlenih*

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Outsource or not? An AHP Based Decision Model for Information Security Management

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Purpose: Outsourcing information security has proven to be an efficient solution for information security management; however, it may not be the most suitable approach for every organization. This research aimed to develop a multi-criteria decision-making model that would enable organizations to determine which approach to information security management (outsourcing or internal management) is more suitable for their needs and capabilities.
Methods: Our study utilized several different research methods. First, the decision criteria were identified by reviewing related work and then selected by information security experts in a focus group. Second, a survey was conducted among information security practitioners to assign the criteria weights. Third, four use cases were conducted with four real-world organizations to assess the usability, ease of use, and usefulness of the developed model.
Results: We developed a ten-criteria model based on the analytic hierarchy process. The survey results promote performance-related criteria as more important than efficiency-focused criteria. Evidence from use cases proves that the decision model is useful and appropriate for various organizations.
Conclusion: To make informed decisions on approaching information security management, organizations must first conduct a thorough analysis of their capabilities and needs and investigate potential external contractors. In such a case, the proposed model can serve as a useful support tool in the decision-making process to obtain clear recommendations tailored to factual circumstances.

Keywords: *Information security, Decision model, Analytic hierarchy process, AHP, Management, Outsourcing*

1 Introduction

With the rise in the quantity and value of information, information security (IS) incidents and threat actors are also steadily increasing (Cisco, 2018). In 2019 alone, enterprises have reportedly suffered three and a half billion U.S. dollars in cybersecurity-related damages (Clement, 2020). As a result, the protection of information and information systems has become an important responsibility of modern organizations. While an IS program is necessary for organizations to survive, it requires substantial financial investments (Leszczyna & Litwin, 2020) and considerable managerial effort since information security management (ISM) is a complex task (Ponsard et al., 2018). Outsourcing has already been identified as a somewhat effective solution for efficient and cost-effective IS programs (Cezar et al., 2016).

However, outsourcing is not suitable for every organization, as it is also associated with various risks and uncertainties, such as hidden costs (Liu et al., 2018), loss of managerial control (Shahrasbi et al., 2017), and questionable quality of service (Feng & Chen, 2017). To determine whether outsourcing is an appropriate solution for their IS program, organizations must weigh between potential

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risks and benefits of choosing such an approach. The emergence of potential risks varies based on the characteristics of individual organizations, their IS demands, and their financial and other resource capabilities (Beybutov, 2009). Organizations must thus consider many factors that vary in importance, which can be a demanding task. When approaching complex decisions, decision-makers often rely on decision models that serve as a tool for weighing different alternatives.

Decision models for information technology (IT) outsourcing have already been developed (e.g., Faisal & Raza, 2016; Pakpahan et al., 2021); however, a review of existing literature shows that no such model has been developed for deliberation over outsourcing and internal (in-house) ISM. Although there are a large amount of multi-criteria decision-making models (MCDM) available in the literature (Kabir et al., 2014), AHP is among the most appropriate MCDM methods for solving complex problems (Božičević et al., 2021; Ishizaka & Siraj, 2018). Hence, it was used by several researchers in IT management. Nonetheless, with a few exceptions (e.g., Faisal & Raza, 2016; Gulla & Gupta, 2011), most models only provide a theoretical AHP framework with identified but not prioritized decision criteria. Furthermore, use cases, which would support the usability of proposed models, are rarely provided. These shortcomings significantly lower the usability of existing decision models in practice and complicate the decision-making process for organizations. The main purpose of this paper is thus to present a scientifically based and practical decision model for ISM, designed for the decision-makers when optioning for the most appropriate ISM approach.

2 Preliminaries

2.1 Information security outsourcing

IS outsourcing can be an efficient solution for implementing and maintaining IS programs, specifically for organizations that do not possess the staff, funds, or knowledge to manage IS efficiently (Cezar et al., 2016). Outsourcing has already established itself as an efficient way to manage support services, such as accounting and sales (Popp et al., 2020), customer support call centers (Ren & Zhou, 2008), and legal services (Lacity & Willcocks, 2013). Since the "Kodak experiment" in 1989, IT has also become a popular outsourced support service (Dibbern et al., 2004).

Because of the growth and diversification of the IT field, IS soon became a service to be outsourced separately to maintain service quality (Fenn et al., 2002). In 2001, 19 percent of organizations reportedly outsourced their IT-related security services, while in 2018, a third of companies reported on such business practice (Cybersecurity Insiders, 2018). It is estimated that the managed security services providers (MSSP) market will keep growing, with a market value projection of 46.4 billion USD in 2025 (MarketsAndMarkets, 2020).

Organizations usually outsource a wide variety of IS services, from specific perimeter protection, including firewalls, intrusion detection systems, and virtual private networks, to more holistic security services, such as event monitoring and incident management (e.g., emergency response and forensic analysis) provided through SOCs. Despite the wide range of services that can be hired, a decision on whether to outsource or not and which IS service to outsource should be made upon considering the potential advantages, related risks, the needs of the organization, and its capability to perform the service internally (Wu et al., 2017).

There are several advantages of outsourcing IS. Most organizations mainly decide to outsource IS due to the cost-efficiency and more stable expenses (Sung & Kang, 2017). One crucial advantage of outsourcing is access to adequate resources, specialized technologies, advanced solutions, and a skilled workforce (Feng, Wang, et al., 2019). Moreover, MSSPs usually offer their services to several different enterprises, enabling them to detect IS risks quicker and more efficiently and distribute their knowledge across different organizations (Liu et al., 2018). Authors also note that mitigation of IS services enables management to focus more on their core activities (Ključnikov et al., 2019), perform faster incident response (Zúñiga & Jaatun, 2016), and improve regulatory compliance (Cezar et al., 2016).

Nevertheless, there are also disadvantages to IS outsourcing. Hiring an MSSP may not always result in predictable costs. It can lead to unplanned and hidden expenses since such relationships are influenced by the ever-changing cyberspace and threat landscape (Liu et al., 2018). Cutting costs can also lead to a decrease in service quality (Feng & Chen, 2017). One of the main risks of IS outsourcing is the loss of internal control over IS services (Shahrasbi et al., 2017). Outsourcing any kind of IT process generally presents a threat to IS, as it connects the organizational network with third-party information systems, which significantly expands the threat landscape (Feng, Wang, et al., 2019). For example, 53% of organizations reported a third-party information system-related security incident in 2019 (Ponemon Institute, 2019).

Other issues of IS outsourcing include issues related to the flexibility of the MSSP to provide their services across different and complex information systems (Beybutov, 2009). MSSP insider threats are also possible and a dilemma on what happens with the outsourced service if the MSSP goes out of business (Feng, Chen, et al., 2019).

Despite the many advantages of IS outsourcing, potential risks and issues can emerge if the process is not implemented properly. Since IS outsourcing is not appro-

priate for every organization, organizations must make an informed decision on how to manage the IS services. Decision models can provide a practical and efficient solution for such a dilemma, as they enable the organization to make rational decisions based on scientifically proven and validated decision factors.

2.2 Analytic hierarchy process

IS is a complex problem comprised of several security aspects (e.g., environmental security, device security, network monitoring, vulnerability scanning, virus prevention, data backup, access control, encryption, and intrusion detection (He & An, 2016). Hence there is a significant need for informed and comprehensive decision-making regarding its management. As already highlighted in the introduction, the AHP is a highly regarded MCDM method that has already been used in IT management research (Božičević et al., 2021; J. J. Wang et al., 2008). AHP divides complex problems into smaller pieces, making them more manageable. This helps decision-makers see those aspects isolated and independently to make more transparent and suitable decisions.

The AHP decision process is originally divided into three core phases (Saaty, 1990). However, to describe the AHP process in more detail, unequivocally, and comprehensively, we present this three-phase process in fourteen steps (Figure 1). In the first phase, a hierarchical structure for the decision model should be created (steps 1 – 4). In the second phase, relative priorities (local priorities) should be determined based on pairwise comparisons through a structured questionnaire (steps 5 – 9). The final phase is represented by a synthesis of the relative priorities into global priorities, which yields the final decision proposal (steps 10 – 14). Such compartmentalization of the process may be helpful for decision-makers to better differentiate between distinct phases and steps to be undertaken and understanding our model proposed in sections 3 and 4.

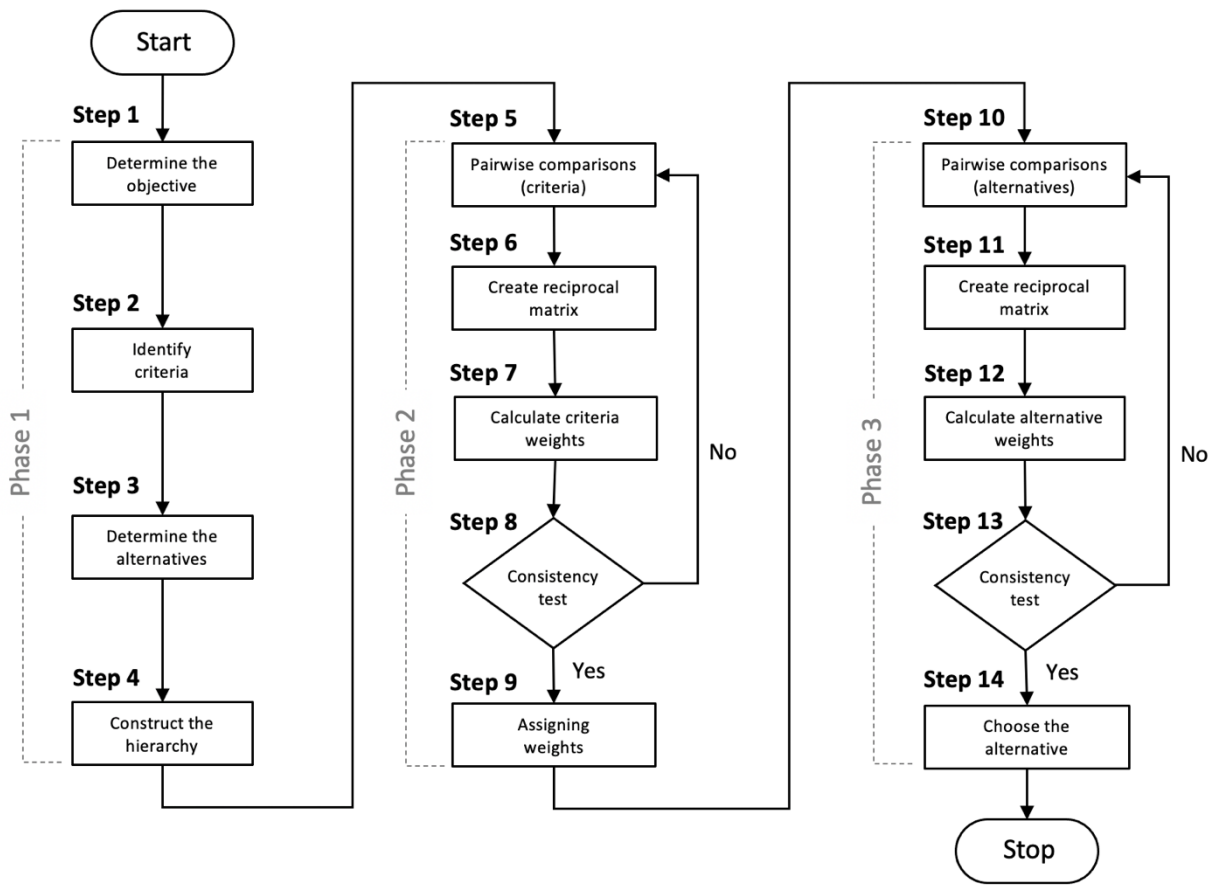

Figure 1: Analytic hierarchy process methodology overview

Phase 1. Step 1 (all steps in the following refer to Fig. 1) requires determining the main objective of the decision-making. In step 2, criteria influencing the decision-making process should be identified. Then at least two decision alternatives should be set in step 3, and a hierarchy model should be constructed in step 4. A picturesque example of an objective would be a decision on buying a house, where criteria for the decision could be location and year of construction, while alternatives would be a house A and a house B.

Phase 2. Step 5 is represented by the pairwise comparisons. Each identified criteria should be compared on a pairwise comparison scale in a structured questionnaire. The results enable determining the degree of preference for which criteria are more important and by how much. Even though a nine-point scale (with five principal values and four intermediate values) is recommended according to Saaty (1990), a lower number of scale points (e.g., scale without intermediate values) were also deemed sufficient and have been used in previous research (e.g., Harker and Vargas, 1987; G. Wang et al., 2009).

Following the previous example, a question may be: "Please choose which criterion when buying a house is more important to you and by how much." For example, criteria when buying a house might be location, price, and size. Criteria pairs are then compared, as seen in Figure 2.

Based on the results of pairwise comparisons, values are entered in a reciprocal comparison matrix in step 6. Values to the left of »1 – Equally important« are inserted above the diagonal of the matrix as absolute values, while values on the right side are inserted as reciprocal values. The part of the matrix below the diagonal is therefore filled with reciprocal values of the values above the diagonal so that j_ij= 1⁄j_ji . In case of the comparisons seen in Figure 2 (criteria Cri_x,Cri_y *and* Cri_z), the following reciprocal matrix is formed as follows:

$$A = \begin{bmatrix} 1 & \frac{1}{3} & 3 \\ 3 & 1 & 4 \\ \frac{1}{3} & \frac{1}{4} & 1 \end{bmatrix} \quad (1)$$

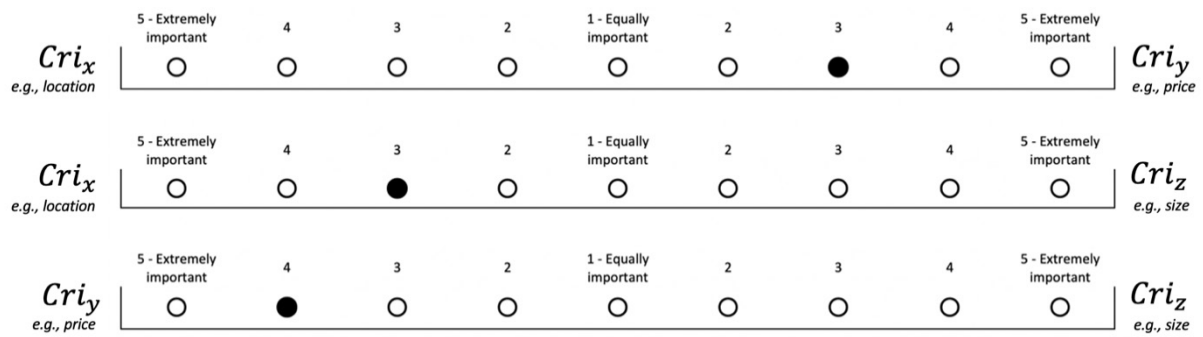

Figure 2: Example of pairwise comparison scale with selected preferences (Cri – criteria)

Weights are calculated from the reciprocal matrix with the eigenvalue method in step 7. Relative weights can be determined by the right principal eigenvector related to the largest eigenvalue of the reciprocal matrix *A*. Therefore, the vector of weights $\vec{w}$ satisfies the equation:

$$A \cdot \vec{w} = \lambda_{max} \cdot \vec{w} \quad (2)$$

where λ_{max} is the maximal eigenvalue. Relative weight w_i is calculated with the square root method:

$$w_i = \frac{\sqrt[n]{\prod_{j=1}^{n} j_{ij}}}{\sum_{i=1}^{n} \sqrt[n]{\prod_{j=1}^{n} j_{ij}}} \quad (3)$$

When the relative weight is computed, λ_{max} can be determined:

$$\lambda_{max} = \frac{1}{n} \sum_{i=1}^{n} \frac{(Bw)_i}{w_i} \quad (4)$$

Since the evaluation requires a certain level of matrix consistency, the consistency test should be performed in step 8. The consistency index (*CI*) should be calculated as follows:

$$CI = \frac{\lambda_{max} - n}{n - 1} \quad (5)$$

where n is the number of independent rows in the matrix. If the matrix is perfectly consistent, then $CI=0$. However, the possibility of consistency error is increased with the increase of pairwise comparisons. Hence, the consistency ratio (*CR*) should be calculated as:

$$CR = \frac{CI}{RI} \quad (6)$$

where *RI* is a random index, represented by average *CI* values gathered from a randomly filled matrices. Usually, the *RI* is calculated based on 500 generated matrices (Ishizaka & Siraj, 2018). The *CR* value should range from 0 to 0.1. If the *CR* value exceeds 0.1, pairwise comparisons should be repeated. If the *CR* value is in the acceptable range, weights previously calculated according to (3) are assigned to all criteria (step 9).

Phase 3. Like pairwise comparisons of criteria in step 5, a pairwise comparison of the alternatives should also be conducted for each criterion in step 10. Following the previous example, a question may be: "Please choose which alternative is more important to you based on the location of the house – and for how much."

For creating a reciprocal matrix, calculating weights for alternatives and consistency ratio for comparisons (steps 11 – 12), steps 6 – 8 should be repeated. However, when only two alternatives are compared (e.g., outsourcing ISM and internal ISM), a consistency index will always equal CI=0. In such cases, step 13 can be omitted. Weight values assigned to the alternatives may range from 0 to 1, while their summation should always equal 1. The alternative with the higher weight value represents the proposed decision (step 14).

Calculations presented in this section are explained in more detail in Saaty (1980) and Markcikić & Radovanov (2011).

2.3 Related work

Since the decision on whether to outsource an IT service is a complex task, several decision models have been developed to help the management reach the right decision. Transaction cost theory, agency theory, and knowledge-based theory have been used frequently to determine which factors influence the decision to outsource IT-related services (Jain & Natarajan, 2011). These theories primarily focus on the cost-benefit perspective of outsourcing and promote factors such as strategic importance of service, outcome measurability and service observability, cost advantage, and service complexity. As such theoretical models explain the decision behind outsourcing, rather than provide the organization with help in the decision-making process, several more practice-oriented models have been developed. These are, in many cases, based on AHP.

Atkinson et al. (2015) developed an AHP decision model for IT services outsourcing based on factors such as financial, security, quality, technical, and relational risks. Similar risks have also been considered in other AHP-based decision models (Prakash et al., 2014). Factors associated with management, such as floating and scarcity of specialists, oversight over the service, and service flexibility, have also been identified as crucial for deciding on how to provide an IT service. Furthermore, the ability to focus on core competencies, which results in increased productivity, the strategic importance of the service, and flexibility to manage demand swings are business strategy-related factors that should also be considered (Khan et al., 2022). Other decision factors frequently considered in AHP-based decision models include technological factors, such as availability of state-of-the-art technology (J. J. Wang et al., 2008), economic factors, such as variability of expenses and levels of cost efficiency (Gulla & Gupta, 2011), and service quality (Fusiripong et al., 2020).

Even though several AHP decision models on IT security (e.g., risk modeling) and outsourcing IT services have been proposed in the literature (Gulla & Gupta, 2011; Faisal & Raza, 2016; Pakpahan et al., 2021; Prakash et al., 2014), to the best of our knowledge no IS outsourcing related AHP models had been developed. Other non-AHP-related studies, however, have already addressed several topics related to IS outsourcing. For example, the advantages and disadvantages of IS outsourcing have already been explored (Beybutov, 2009), as well as its risks (Liu et al., 2018). Wu et al. (2017) analyzed strategic decision-making and contractual relationships with MSSPs. Karyda et al. (2006) provided a strategic framework for choosing an IS outsourcing strategy, which includes several decision factors but can only be applied when an organization has already decided to outsource to address the security and privacy issues that may emerge outsourcing. Based on strategic hacker threats, Wu et al. (2020) focused on ensuring optimal levels of security services outsourcing.

Despite some established insights into IS outsourcing, no research has yet connected the findings of those studies to develop a decision model for deciding between internal and external management of IS services.

3 Research objectives and methodology

As ISM remains a problem for many organizations, an MCDM model that would utilize the findings of previous studies could help the decision-makers base their decisions on relevant factors related to the efficiency and quality of IS. To address the gaps in previous research, our main research objectives were to: 1) identify criteria crucial for efficient ISM, which form an essential base for decision-making on whether an IS services should be managed internally or outsourced; 2) prioritize the identified criteria; 3) develop an AHP based decision model for decision-makers in practice; and 4) assess the developed model for its usability, ease of use and usefulness.

To achieve the abovementioned objectives, we developed an AHP-based MCDM model for ISM by closely following the steps discussed in subsection 2.1 (see Figure 1). First, an objective of our model was set (step 1). Second, a structured review of related work was conducted to identify criteria that should be considered when deciding on the ISM approach. A focus group among IS experts was conducted to choose the ten most crucial criteria (step 2). Based on the literature review, the alternatives were determined, and the model hierarchy was proposed (steps 3—4). Next, a survey among IS practitioners was conducted to pairwise compare the identified criteria (step 5), followed by criteria prioritization and the consistency test using the AHP Online System software (Goepel, 2018) (steps 6—8). Finally, based on the results, weights were assigned to the individual criteria, and a final model was constructed (step 9).

At this stage, our model was developed and ready for use in organizations. To assess the model, we conducted four use cases in four organizations. Decision-makers in real-world organizations provided pairwise comparisons according to their needs and expectations (step 10). Based on the results, alternative weights were calculated and assigned to the alternatives (steps 11—13). In the follow-up survey, the proposed decision was communicated to the organizations (step 14) and discussed with their decision-makers or IT employees. An overview of the research methodology is presented in Figure 3.

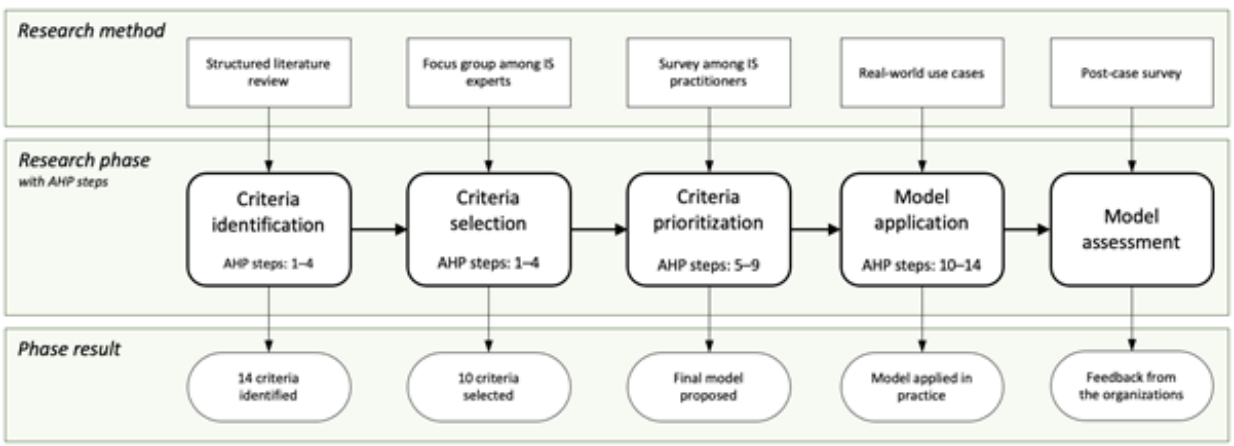

Figure 3: Overview of the research process matched with used methods and results in each phase

4 Model development

The primary objective of our AHP-based MCDM model is to provide organizations with the decision model for deliberating on how to approach ISM efficiently.

4.1 Criteria identification and selection

We identified factors (namely, criteria) contributing to such a decision-making process by reviewing related work on outsourcing. Since IS is strongly associated with IT management, the criteria that apply for ISM and IT management can be derived from existing AHP decision models for outsourcing IT services (J. J. Wang et al., 2008). When deliberating on an approach to IS services provision, criteria that are crucial to ensuring efficient and quality ISM should be the main deciding factors. To identify potentially relevant criteria, we reviewed and analyzed previous research on the discussed topics.

The review included research papers published since 2000. We focused on papers proposing decision models for outsourcing IT-related services and papers that included a description of criteria contributing to efficient ISM. The review revealed 14 unique decision criteria. We describe and summarize their relevance for efficient ISM in Table 1.

Table 1: Identified decision criteria

Criteria	Criteria description	Source
Threat awareness	The organization is well informed on current IS threats, vulnerabilities, and risks.	(e.g., Beybutov, 2009; Feng et al., 2019)
Knowledge of security solutions	The organization is well informed on the most prominent measures and solutions for efficient ISM.	(e.g., Feng et al., 2019; Wu et al., 2017)
Focus on core competence	The organization can maintain a high level of IS without affecting the quality of its core business processes. IS processes have minimal impact on other IT services inside the organization.	(e.g., Faisal & Raza, 2016; Ključnikov et al., 2019)
Flexibility	The organization can adapt its IS program to organizational changes, changes in its business processes, and changes in the threat landscape.	(e.g., Faisal & Raza, 2016; Rajaeian et al., 2015)
Regulatory compliance	The organization is familiar with key laws that regulate ISM, IT systems management, and personal data protection. All organizational activities related to IS follow the regulations.	(e.g., Beckers et al., 2013; Cezar et al., 2016)
Human resources	The organization has access to trained and experienced experts who specialize in executing and managing IS activities.	(e.g., Liu et al., 2018; Wu et al., 2017)
Tools and infrastructure	Adequate material resources (up-to-date software, hardware, and infrastructure) for quality ISM are available.	(e.g., Feng, Chen, et al., 2019; Ključnikov et al., 2019)
Moral hazard	There is a low risk that IT personnel will abuse their user and administrative privileges for malicious activity in the organization.	(e.g., Feng et al., 2019b; Liu et al., 2018)
Interdependency of security risks	The organization maintains a low risk of falling victim to an IS incident due to the connected information systems of business partners or other companies.	(e.g., Feng & Chen, 2017; Feng, Chen, et al., 2019)
Management oversight	The organization can actively control the processes connected to ISM.	(e.g., Aldya et al., 2019; Rajaeian et al., 2015)
Prompt response	The organization can detect IS incidents on time and can react promptly and appropriately.	(e.g., Sung & Kang, 2017; Feng et al., 2019b)
Organizations' reputation	Through quality ISM, the organization maintains the trust of its customers and business partners. The organization can demonstrate its security responsibility to keep the brand respected and recognized as trustworthy.	(e.g., Eduardovich & Vladimirovich, 2016; Zammani et al., 2019)
Business continuity	The organization has plans established for risk management and incident response. In case of an IS incident, the organization can ensure an undisturbed and continuous flow of business processes.	(e.g., Zammani et al., 2019; Chu & So, 2020)
Cost-efficiency	The approach to ISM is rational and economical, consistent with the organization's security and business needs and capabilities.	(e.g., Bojanc et al., 2012; Feng, Wang, et al., 2019)

Analysis of the related work extracted 14 criteria, which we reasonably deduced to ISM. While identified decision criteria individually cover different aspects of IS, it is also important to cover both the strategic and the operational view of managing IS services.

To optimize the process of pairwise comparisons, up to nine decision criteria are recommended on each hierarchical level in the analytic hierarchy process; however, it is not unusual to include ten or more criteria in AHP models (G. Wang et al., 2009). Since our literature review resulted in 14 criteria, we conducted a focus group to reduce the number of criteria to the most relevant ones, as suggested by (Russo & Camanho, 2015).

The ten focus group participants were experts in information and organizational security. Seven respondents were employed as researchers in information and organizational security, and three were employed in organizations providing security services. Their experience ranged from 4 to 20 years (M = 11.1 SD = 5.5). Participants had experience with research work and ISM and were thus able to make a balanced judgment on the importance of included criteria.

Focus group respondents were provided with a criteria description (see Table 1) and asked to evaluate their importance for efficient ISM. Each criterion was evaluated on a seven-point Likert-type scale. The phrase “criteria is completely irrelevant” was assigned to the value 1, and the phrase “criteria is extremely relevant” was assigned to the

value 7. In total, the questionnaire consisted of 14 items (criteria).

Table 2 presents the results of respondents' answers on the importance of individual factors.

We arranged the criteria based on their median values and discussed the results with the participants. The median value was chosen due to the relatively low sample size and use of an ordinal scale. The results show that business continuity, prompt response, cost-efficiency, knowledge of security solutions, and threat awareness most significantly contribute to efficient ISM. On the other hand, flexibility, the interdependency of security risks, moral hazards, and organizations' reputation are the least important for effective ISM and were thus eliminated from the further model development process. Higher standard deviations of the excluded criteria also suggest a higher level of disagreement among the respondents. Even though the median value of the criteria "tools and infrastructure" is relatively low, we concluded it should be included in the final decision model since it has been often highlighted as vital in previous research (Feng, Chen, et al., 2019; Liu et al., 2018). We finally included ten criteria in the decision model.

Table 2: Evaluation of criteria importance (Me – median, M – mean, SD – standard deviation)

Criteria	Me	M	SD
Business continuity	7.0	6.7	0.64
Prompt response	7.0	6.6	0.80
Cost-efficiency	6.5	6.1	0.94
Knowledge of security solutions	6.0	6.1	0.83
Threat awareness	6.0	6.0	0.77
Regulatory compliance	6.0	5.7	1.10
Focus on core competence	6.0	5.6	1.28
Management oversight	6.0	5.6	1.28
Human resources	5.5	5.6	0.66
Tools and infrastructure	5.5	5.4	1.02
Flexibility	5.5	5.4	0.92
Interdependency of security risks	5.0	5.3	1.19
Moral hazard	4.5	4.9	1.64
Organizations' reputation	4.5	4.9	1.45

Based on the identified criteria and a review of previous research, two alternatives for ISM were determined: (1) managing information security internally or (2) outsourcing information security services.

Next, the decision model was conceptualized by constructing the hierarchy. The first level of the decision model is represented by setting the objective – efficient approach to ISM in organizations. The second level is represented by the ten identified criteria. The two alternatives represent the third level. The model is presented in Figure 4 (standard AHP hierarchy visualization).

4.2 Criteria prioritization

In this research phase, we addressed the importance of individual criteria by conducting pairwise comparisons and allocating each criterion with a decision weight (prioritization).

We conducted an online survey among Slovenian IS practitioners to obtain the necessary data to calculate the weights. The questionnaire was designed for respondents to conduct pairwise comparisons of 10 selected criteria according to their importance for efficient ISM. Due to the time efficiency, reduced complexity, and ease of use (Moisaidis, 1999), a five-point pairwise comparison scale was used, with value 1 assigned to the phrase "criteria are equally important" and value 5 assigned to the phrase "criterion is significantly more important". Pairwise comparison questions were formatted in a way that two criteria were written on each side of the questionnaire, with values ranging from 5 to 1 to 5 written between both criteria (for example, see Figure 2). The respondents chose the number they felt best characterized which criterion was more important and by how much. The survey consisted of 45 pairwise comparisons and three demographic questions. We collected demographic data related to gender, years of professional experience with IT or IS, and position in the

organization held by the respondent.

We distributed the survey among IS practitioners who worked in the IS sector or as IS specialists in various organizations. These individuals are considered to have in-depth knowledge of IS-related activities and are thus able to determine the importance of each criterion for efficient ISM. We identified the respondents via LinkedIn, webpages of different organizations related to IS, webpages of various interest groups, and various professional publications. If the email address of the potential respondent was publicly available, the participation request was sent via email directly to the recipient. Otherwise, the participation request was sent via email to the organization where the potential respondent is employed. In addition to the invitation and link to the survey, an email included an attached document describing the criteria. The invitation was also distributed via the Chamber of Commerce and Industry of Slovenia and other IS-related organizations such as the ICT Technological Network of Slovenia and SRIP[1] Smart Cities and Communities. In total, we have directly contacted 37 individuals whose email addresses were publicly available, 29 organizations employing IS specialists, and four organizations that bring together IS specialists. We have received 31 responses from IS practitioners, out of which 25 were male, two were female, and four did not provide the answer. The average respondent has worked in IT or IS for 12.8 years; however, 43% of respondents worked in IT or IS for ten years or less. Six respondents were identified as CEOs, six as project managers, and three as CISOs, while others stated different specialized roles, such as consultant, system administrator, or SOC analyst.

To prioritize the criteria, we first calculated the modes of each comparison made by the IS practitioners in the previous step and created the reciprocal matrix. To ensure the highest accuracy of calculations, specialized software AHP Online System was used (Goepel, 2018). Additionally, the consistency ratio was calculated to ensure the validity of the results (Saaty, 1990). With the consistency ratio of 0.079, the calculated values meet the inconsistency requirements of AHP, which has to be lower than 0.1 (Saaty, 1990). The matrix with the calculated modes of each comparison, calculated weights (w), and standard deviations (SD) is presented in Table 3.

The weights explain to the decision-makers how important criteria are and how seriously they should be considered when deciding between internal management or outsourcing the IS service. Results indicate that prompt response, management oversight, and business continuity are the most important criteria for efficient ISM. On the other hand, threat awareness, human resources, and cost-efficiency appear to be the least important criteria for efficient ISM.

Based on the conceptual model, the model with corresponding weights for every criterion was constructed (Figure 4).

Table 3: Reciprocal matrix (w – criteria weights, SD – standard deviations)*

	1	2	3	4	5	6	7	8	9	10	*w*	SD
1	1	1.00	1.00	1.00	0.33	1.00	1.00	0.33	0.20	1.00	0.064	0.025
2	1.00	1	1.00	1.00	3.00	0.50	1.00	0.25	2.00	1.00	0.097	0.066
3	1.00	1.00	1	1.00	3.00	1.00	1.00	0.33	0.33	1.00	0.082	0.037
4	1.00	1.00	1.00	1	3.00	1.00	1.00	0.33	1.00	1.00	0.090	0.036
5	3.00	0.33	0.33	0.33	1	1.00	0.33	0.25	1.00	1.00	0.066	0.049
6	1.00	2.00	1.00	1.00	1.00	1	1.00	0.33	1.00	1.00	0.087	0.037
7	1.00	1.00	1.00	1.00	3.00	1.00	1	1.00	1.00	1.00	0.102	0.046
8	3.00	4.00	3.00	3.00	4.00	3.00	1.00	1	1.00	3.00	0.206	0.071
9	5.00	0.50	3.00	1.00	1.00	1.00	1.00	1.00	1	3.00	0.137	0.081
10	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	1	0.070	0.016

*Numbers from 1 to 10 in the first column and the first row represent individual criteria: 1 – Threat awareness, 2 – Knowledge of security solutions, 3 – Focus on core competence, 4 – Regulatory compliance, 5 – Human resources, 6 – Tools and infrastructure, 7 – Management oversight, 8 – Prompt response, 9 – Business continuity, and 10 – Cost-efficiency.

[1] Strategic Research & Innovation Partnership (slo. Strateško Razvojno Inovacijsko Partnerstvo)

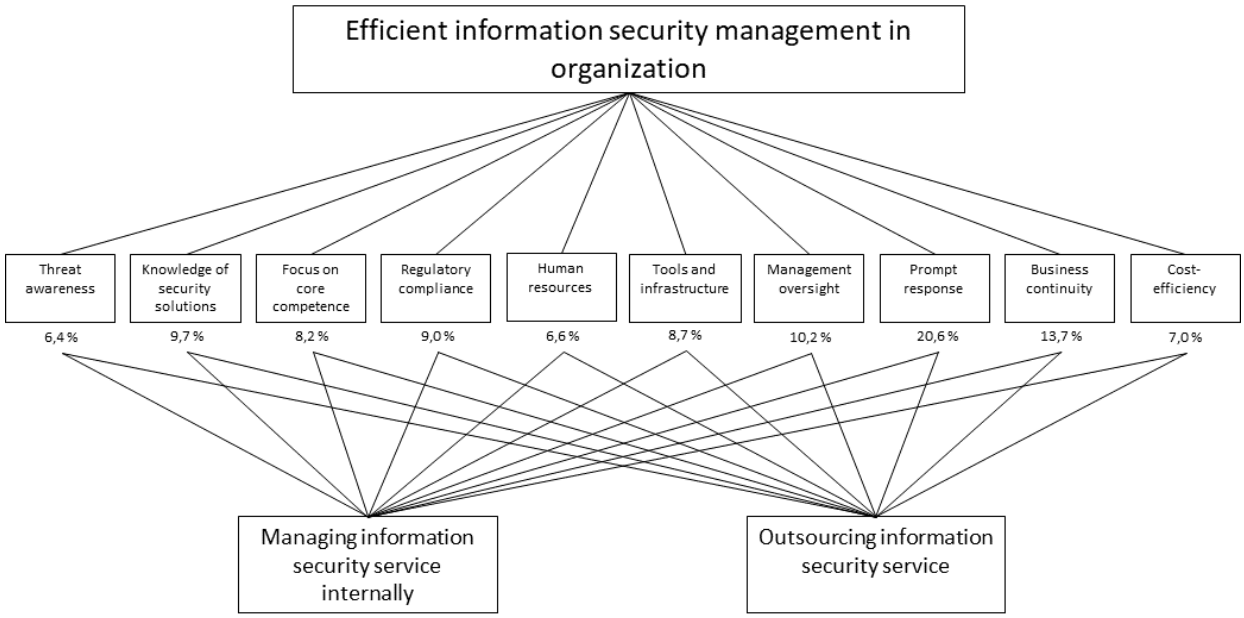

Figure 4: Developed decision model with assigned criteria weights

5 Model application

Thus far, the model development has been completed. Organizations that would like to use the model for deciding on the approach to ISM should now take steps 10 – 14. Since we compared only two alternatives, step 13 was omitted. To illustrate these steps and the use of the developed model, as well as to assess the model, we conducted four real-world use cases. Four organizations were selected by convenience sampling and included in the model assessment. Two organizations were sourced from the public sector, and two were sourced from the private sector. Organizations were invited to pairwise compare the two alternatives against all the criteria. To ensure the accuracy of calculations, we calculated alternative weights for the participating companies and communicated the results.

Each organization was asked to fill out an online survey where they compared the alternatives, considering each of the ten selected criteria (see Table 2) on a five-point pairwise comparison scale (for example, see Figure 2). Organizations were also asked to provide information on how dependent they are on IT, how high they rank the current state of IS in the organization, and how many employees are responsible for managing IT in the organization. Each organization was asked to forward the online survey to the employee(s) responsible for the IT management. Use cases are presented in the following subsections.

5.1 First use case

The first use case was conducted with a privately owned graphic design and retail company, employing between five and nine people (Spriv). The organization did not employ any staff dedicated to IT management. However, they were somewhat IT-dependent. Their self-reported level of IS in the organization was mediocre.

The results of the first use case are presented in Table 4. Results indicate that outsourcing IS is a preferred option. The organization preferred outsourcing concerning all criteria except for “focus on the core competence”.

5.2 Second use case

The second use case was conducted with a privately owned production and wholesale company, employing between 10 and 19 people (Mpriv). The organization had one employee dedicated to IT management and was highly dependent on IT. Their self-reported level of IS in the organization was mediocre.

Even though the results slightly turn towards in-house management of IS, the model does not decisively advocate any of the alternatives. The results of the second use case are presented in Table 5.

Table 4: Results of the first use case (w – criteria weights, W – alternative weight)

Criteria	*w*	Outsourcing	In-house
Threat awareness	0.064	3	0.33
Knowledge of security solutions	0.097	3	0.33
Focus on core competence	0.082	0.33	3
Regulatory compliance	0.09	3	0.33
Human resources	0.066	3	0.33
Tools and infrastructure	0.087	3	0.33
Management oversight	0.102	3	0.33
Prompt response	0.206	3	0.33
Business continuity	0.137	3	0.33
Cost-efficiency	0.07	3	0.33
W		**0.83**	**0.17**

Table 5: Results of the second use case (w – criteria weights, W – alternative weight)

Criteria	*w*	Outsourcing	In-house
Threat awareness	0.064	1	1
Knowledge of security solutions	0.097	2	0.5
Focus on core competence	0.082	2	0.5
Regulatory compliance	0.09	1	1
Human resources	0.066	0.5	2
Tools and infrastructure	0.087	3	0.33
Management oversight	0.102	0.2	5
Prompt response	0.206	1	1
Business continuity	0.137	1	1
Cost-efficiency	0.07	0.25	4
W		**0.49**	**0.51**

The organization deemed the alternatives evenly matched regarding four criteria and one alternative slightly more suitable concerning the remaining three criteria. Only in cases of management oversight and cost-efficiency in-house management of IS was identified to be significantly more suitable than outsourcing.

5.3 Third use case

The third use case was conducted with a publicly owned organization (primary school), employing between 10 and 19 people (Spub). The organization had one employee dedicated to IT management and was very dependent on IT. Their self-reported level of IS in the organization was mediocre.

Results indicate that in-house management of IS is the preferred option. The organization preferred in-house management concerning all criteria except for threat awareness and regulatory compliance. The results of the third use case are presented in Table 6.

5.4 Fourth use case

The fourth use case was conducted with a publicly owned organization (high school), employing between 100 and 149 people (Mpub). The organization had two

employees dedicated to IT management, and the organization stated that they are highly dependent on IT. Their self-reported level of IS was mediocre.

Even though the results slightly turn towards outsourcing IS, the model does not decisively advocate any of the alternatives. The results of the fourth use case are presented in Table 7.

Concerning the first six criteria, the organization did not distinguish between the alternatives. The organization did prefer outsourcing regarding the two most important criteria – prompt response and business continuity. The organization preferred in-house IS management regarding management oversight and cost-efficiency. However, since the organization mostly deemed all criteria equally important, the result does not significantly advocate one alternative as more suitable than the other.

Table 6: Results of the third use case (w – criteria weights, W – alternative weight)

Criteria	***w***	**Outsourcing**	**In-house**
Threat awareness	0.064	1	1
Knowledge of security solutions	0.097	0.2	5
Focus on core competence	0.082	0.2	5
Regulatory compliance	0.09	5	0.2
Human resources	0.066	0.2	5
Tools and infrastructure	0.087	0.2	5
Management oversight	0.102	0.2	5
Prompt response	0.206	0.2	5
Business continuity	0.137	0.2	5
Cost-efficiency	0.07	0.2	5
W		**0.15**	**0.85**

Table 7: Results of the fourth use case (w – criteria weights, W – alternative weight)

Criteria	***w***	**Outsourcing**	**In-house**
Threat awareness	0.064	1	1
Knowledge of security solutions	0.097	1	1
Focus on core competence	0.082	1	1
Regulatory compliance	0.09	1	1
Human resources	0.066	1	1
Tools and infrastructure	0.087	1	1
Management oversight	0.102	0.33	3
Prompt response	0.206	2	0.5
Business continuity	0.137	3	0.33
Cost-efficiency	0.07	0.33	3
W		**0.55**	**0.45**

6 Model assessment

In an additional follow-up survey, we provided the organizations included in use-cases with the results and asked them to provide feedback. In the form of four open-ended questions, the organizations were asked to state if they practice or would choose the same approach for ISM as the decision model suggested and to provide feedback on the perceived usefulness of the decision model for their organization and other organizations. Each organization was also asked to evaluate if the model is suitable for use in IS planning activities and the adequacy of the chosen decision criteria. At the end of the survey, respondents could freely discuss and comment on the decision model. The answers are presented in a consolidated form in the following.

Q1: Would you choose the same approach to ISM as suggested by the model?

All participating organizations agreed with the alternative suggested by the model and stated that they would choose the same approach as suggested by the decision model. Moreover, even though the result in the two cases was slightly ambiguous, the organization Mpriv highlighted that the result provided them a critical insight based on which they started considering outsourcing ISM and other IT-related activities, thus strengthening the level of their IS.

Q2: How suitable do you find the model for decision-making on ISM in your organization and/or other organizations?

All participating organizations stated that they find the developed model suitable for decision-making for ISM for their organization. Nonetheless, they agree that there might be some room for improvement. The improvement should primarily focus on tailoring the criteria to their specific organization. Pre-set criteria, however, provide a certain level of objectivity and reduce the stress of decision-makers in small organizations on whether chosen criteria are suitable for a particular ISM problem.

Q3: Would you choose this model for other information security-related decisions for your organization?

Participating organizations uniformly agreed on the model's suitability for any ISM problem. The reason predominantly lies behind pre-defined decision criteria, which ultimately play the same significant role in any IS-related decision-making. The organization Spub informally suggested pre-setting several AHP models based on these criteria addressing several major ISM problems. These pre-set models would be used in their future ISM decision-making.

Q4: How suitable do you find the criteria for ISM decision-making?

Participating organizations recognized the universal nature of the criteria used in the developed model. As previously mentioned, Spub suggested pre-setting several models that would address different ISM problems with the same criteria they find suitable and adequate. However, the organization Spriv would prefer a larger number of criteria based on which the alternative would be suggested, even though they find the current array of criteria adequate.

Participating organizations concluded that the approach to decision-making with the developed model is easy to use and does not require prior knowledge regarding AHP or other MCDM methods. Along with the fact that it is ready-made, it is a time-efficient method for decision-making for ISM. The results of the use cases suggest the model's usability, ease of use, and usefulness. Table 8 presents a summary of conducted use cases.

7 Discussion

Provision of IS is a vital function in mature organizations, as it contributes to their compliance, resilience, and social responsibility. However, IS is a complex system intertwined with many challenges related to organizational security needs, responsibilities, and capabilities. A thoughtful approach to the decision-making and management of such a system is thus necessary. Organizations can generally choose to manage IS internally or opt for outsourcing. However, the decision requires consideration of various factors as both approaches have several (dis) advantages. Consequently, many organizations face a dilemma on which approach is more appropriate.

The current study aimed to identify key criteria to consider in establishing efficient ISM and develop an MCDM model that helps organizations determine which approach to ISM is more suitable for their needs and capabilities. The results highlighted that business reputation and risks associated with the exertion of IS are among the least important criteria to be considered, albeit not insignificant. On the other hand, a prompt response is the most important criterion for an efficient ISM, which is consistent with the research findings of several previous studies. It is of utmost importance for fast incident detection (Zúñiga & Jaatun, 2016). It is also crucial in all steps of handling an incident, as it can contain the expansion of the breach and reduce the time in which business is limited due to the incident (Sung & Kang, 2017).

According to our research, business continuity and managerial oversight over IS activities are the two next most crucial criteria. Business continuity and IS are closely related, as each IS program must be designed to ensure business continuity (Chu & So, 2020). While business continuity is a consequence rather than an antecedent of the IS activities, our results suggest that the ISM approach needs to consider developing such capabilities and incorporate them into the planning stages. Furthermore, managerial oversight provides transparency and, to some effect, also looks after the legal aspects of the IS program (Georg, 2017). It can also provide a greater understanding of IS

Table 8: Summary of conducted use cases

ID.	Size (employees)	IT employees	IT dependency level	Current level of IS	Model result	Feedback summary
S_{priv}	5 – 9	0	Somewhat dependent	Mediocre	Outsourcing	The organization agrees with the model's result. They find the model and criteria suitable for them as well as for other organizations. Since they do not have any dedicated IT staff, the result was expected, but they still find the model interesting for possible future decisions on ISM.
M_{priv}	10 – 19	1	Completely dependent	Mediocre	In-house	The organization agrees with the model's result. They find the model valuable. The result encouraged them to incorporate security into their IT management process.
S_{pub}	10 – 19	1	Highly dependent	Mediocre	In-house	The organization agrees with the proposed approach. They find the model and criteria suitable for decision-making, and they will use the decision model in the future.
M_{pub}	100 – 149	2	Highly dependent	Mediocre	Outsourcing	The organization stated that they would choose the same approach as suggested by the model. They find the model and criteria suitable for them and other organizations. They also stated that the model is usable for further IS-related decision-making.

maturity and encourage appropriate financial and infrastructure support for the program (Atmojo et al., 2019).

The aforementioned criteria that were deemed most important focus on the IS performance rather than on the predispositions that need to be met for an efficient approach. Hence, organizations should primarily focus on the overall quality of service and consider costs, staffing, and technical aspects secondarily. While other studies suggest the importance of cost-efficiency (Wu et al., 2017), our results indicate that overall quality of service should be considered first if the primary goal is a mature and robust ISM. Certainly, costs and capabilities must not be overlooked in deciding on an ISM approach. However, increasing response time in exchange for lower costs should not be acceptable.

The results of four use cases performed in real-world organizations suggest that the proposed decision model is valuable and appropriate for various organizations. In the case of two organizations, the decision model strongly recommended in-house management and outsourcing, respectively, with both organizations agreeing with the proposal. In the case of two other organizations, the decision model did not decisively promote any alternatives. This occurs when the decision-maker using the model determines the alternatives as equally suitable regarding the criteria (Saaty & Tran, 2007). There are several potential reasons for such tentativeness. First, prior to using the model, organizations need to be aware of their abilities, needs, and resources. If the organization is not thoroughly familiar with its IS-related needs and resources, it can be hard to assess which alternative is more suitable regarding given criteria. Other studies addressing IT outsourcing also caution about the same issue (Feng, Chen, et al., 2019; Liu et al., 2018). Second, organizations can be indifferent toward certain factors (e.g., if the organization does not have the technical capabilities). In such a case, both alternatives can present a significant investment (Wu et al., 2017), leading to the organization not having a preference. Therefore, it is vital for organizations to thoroughly analyze their current state and capabilities of potential external contractors before comparing both options using the decision model. While the decision model only provided

explicit recommendations for two organizations, all four deemed the model as practical and helpful. Both organizations that were left without definite suggestions also indicated that the model raised their IS awareness, which further demonstrates its usefulness.

The use cases have also shown that scientifically supported systematic development of problem-solving methods does not necessarily provide clear solutions or answers. Solving real-world problems requires a thoughtful approach tailored to factual circumstances. Moreover, although complex problems are often solvable with straightforward solutions, we demonstrated that this is not always the case, especially in the circumstances related to high financial and security risks, such as IS in organizational settings. On this note, we can conclude that the proposed decision model is an effective tool and can be of great assistance in planning the organization's IS program; however, it should serve as a mere step in the decision-making process.

7.1 Implications, limitations, and future work

This research provides several theoretical and practical implications. To the best of our knowledge, this is not only the first AHP-based but also the first overall decision model explicitly developed for deliberating between outsourcing and in-house ISM. Our model is ready-made and to be used without having to identify and prioritize the decision criteria. This research also presents use cases where the developed decision model was utilized to emphasize its usability. Along with step-by-step guidelines provided in this paper, use cases provide a real-world assessment of the model and enable enterprises its straightforward application. Hence, the model can be directly applied to any small to a medium-sized organization aiming to plan an ISM. Use cases indicate that participating enterprises perceive the model as functional and easy to use. The developed decision model thus enables organizations a practical, scientifically substantiated, and systematic decision-making approach for ISM.

This research presents several limitations. First, since ten criteria were used to construct the decision model, some criteria had to be omitted. Even though scaling down the model was done to maintain the model's ease of use and overall usability (also suggested by Russo & Camanho (2015)), some of the omitted criteria could be considered important. Second, experts participating in the focus group and practitioners taking the survey were chosen by convenient sampling. Even though we provided different sizes of organizations and selected two organizations from the public sector and two from the private sector, convenient sampling was also used for choosing the participating enterprises. Third, pairwise comparisons were only made by IS specialists. Since we did not obtain the opinion of the managers, the model is slightly balanced toward the effectiveness of the IS and assigns less importance to the strategic criteria. Fourth, the model was not tested against any other decision model. Since such comparison was not possible due to the non-existence of similar decision models for ISM, we conducted a follow-up survey. The survey provided an alternative to such benchmark testing; however, further work on this topic is required.

Hence, our research findings and the developed model should serve as an incentive for further research. While our model provides adequate criteria weights for efficient decision-making, future work should provide a broader and more diverse sample of experts and practitioners to ensure higher uniformity in relevance assessments and prioritization of criteria. Likewise, decision-makers' opinions should be considered in the future to increase the validity of the decision model. Furthermore, future research should upgrade the model by including additional criteria across several hierarchical levels. That could also increase the model's validity and provide organizations with even more interpretable recommendations. In addition, the efficiency aspect must be more thoroughly investigated. Financial costs and investment in IS, for example, are well-researched topics (Bojanc et al., 2012); however, the costs and benefits of outsourcing are not investigated sufficiently.

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Zunanje izvajanje ali ne? Na AHP metodi osnovan odločitveni model za upravljanje informacijske varnosti

Namen: Zunanje izvajanje informacijske varnosti se je izkazalo kot učinkovita rešitev za upravljanje informacijske varnosti. Kljub temu pa tak pristop ni najprimernejši za vsako organizacijo. Cilj raziskave je bil razviti večkriterijski odločitveni model, ki organizacijam pomaga pri odločanju kateri pristop k upravljanju informacijske varnosti (zunanje izvajanje ali notranje upravljanje) je bolj primeren za njihove potrebe in zmožnosti.
Metode: Naša raziskava temelji na različnih raziskovalnih metodah. Prvič, kriteriji odločanja so bili identificirani na podlagi pregleda literature, nato pa izbrani s pomočjo fokusne skupine med strokovnjaki za informacijsko varnost. Drugič, da bi kriterijem določili uteži, smo izvedli anketo med strokovnjaki za informacijsko varnost iz prakse. Tretjič, da bi ocenili izvedljivost, enostavnost uporabe in uporabnost modela, smo izvedli štiri primere uporabe v organizacijah.
Rezultati: Razvili smo deset-kriterijski odločitveni model, ki temelji na analitičnem hierarhičnem procesu. Rezultati ankete nakazujejo na to, da so kriteriji, povezani z uspešnostjo, pomembnejši od kriterijev, ki se osredotočajo na učinkovitost. Rezultati primerov uporabe prikazujejo, da je odločitveni model uporaben v različnih organizacijah.
Zaključek: Za sprejemanje utemeljenih odločitev o pristopu k upravljanju informacijske varnosti morajo organizacije najprej opraviti temeljito analizo svojih zmogljivosti in potreb. V tem primeru lahko predlagani model služi kot uporabno podporno orodje v procesu odločanja za pridobitev jasnih priporočil, prilagojenih dejanskim okoliščinam.

Ključne besede: *Informacijska varnost, Odločitveni model, Analitični hierarhični proces, AHP, Management, Zunanje izvajanje*

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The Interplay of Restaurant SMEs' Entrepreneurial and Environmental Characteristics, Management of the Requisite Assets, and Operational Efficiency

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Background/Purpose: SMEs are subject to different factors in the business environments that influence their business performance. Considering the importance of restaurants' environmental characteristics, entrepreneurs can also, through their entrepreneurial characteristics, influence SMEs' management of the requisite assets (MRA). Accordingly, this study examines the influence of restaurant SMEs' entrepreneurial (self-efficacy, orientation, and demographics) and environmental (location, size, and competition) characteristics on MRA and, consequently, on SMEs' operational efficiency.
Methods: Primary data relating to the environmental (location, size, and competition) and entrepreneurial (self-efficacy, orientation, and demographic) characteristics were obtained using a survey questionnaire, while the secondary data were obtained from SMEs' official financial reports. The sample consists of 266 restaurant SMEs in the Republic of Slovenia. Efficiency was analysed using data envelopment analysis (DEA), and structural equation modelling (SEM) was used to test the research model.
Results: The results indicate that environmental characteristics have a much more significant impact on MRA than entrepreneurial characteristics. Entrepreneurial self-efficacy and most demographic characteristics (age, gender, education, and experience) proved not to influence significantly MRA and, consequently, SMEs' operational efficiency.
Conclusion: SMEs' external environment is generally not directly influenced by managerial decisions. Therefore, it is critical to strengthen the influence of the internal environment through an active development of entrepreneurial characteristics, which could result in a more effective MRA and higher efficiency. The conclusion provides suggestions for future research and valuable information for entrepreneurs, academia, and policymakers.

Keywords: *SMEs, Restaurant industry, Slovenia, Efficiency, Environmental and entrepreneurial characteristics, Requisite assets*

1 Introduction

Tourism, and therefore the restaurant industry, is an important economic activity. Until 2019 (before the outbreak of the Covid-19 pandemic), the growth rates of gross domestic product (GDP) in tourism were higher than in the global economy (WTTC, 2020). The restaurant industry has also achieved strong growth in sales volumes and prof-

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itability in this context. Globally, tourism accounted for 10.4% of GDP in 2019, while in the Republic of Slovenia, a small European economy, tourism contributed 10.6% to GDP. At the same time, the restaurant industry has offered numerous opportunities for the development of micro, small, and medium-sized enterprises (SMEs), which are a hallmark of the tourism and restaurant industry (Morrison et al., 2010). SMEs represent 99.8% of all enterprises in the European Union (EU). Similarly, SMEs represent 99.8% of all business entities in the Republic of Slovenia (a totally of 206.220 enterprises), among which approximately 4% (8,266) operate in the restaurant sector (SURS, 2021). Statistical data (Ajpes, 2021) show that most restaurant businesses are micro SMEs employing less than ten employees, which are mostly registered as sole proprietorship businesses (5,840) (see also Section 4.1 Sample Characteristics).

Apart from being mainly represented by micro SMEs, the restaurant industry has several other industry-specific characteristics, such as labour intensives, volatility of demand, intense competition, combined ownership and managerial (entrepreneurial) function and active involvement of family members in the operational process, the importance of the location for business success, monopolistic competition, and many others (Hallak et al., 2018). According to Peters and Kallmuenzer (2018), SMEs can be characterised as a complex system of personal and business dimensions, which have advantages (e.g. flexibility) and disadvantages (e.g. lack of strategic planning) regarding their business performance.

The characteristics mentioned above belong to the internal business environment (within managerial purview - controllable) and external business environment (beyond managerial (direct) purview - uncontrollable). Restaurant industry characteristics significantly affect restaurant firms' financial performance, generally characterised by low revenue profitability and low survival rates (Lee et al., 2016). Despite its unique context, the restaurant industry is the most significant sector and the largest employer within the tourism industry (Dube et al., 2020).

All restaurant businesses strive to operate efficiently and effectively. Efficiency refers to the relationship between the observed and optimal values of inputs and outputs (Fried et al., 2008), while effectiveness primarily refers to financial performance. Research on efficiency in tourism has mainly focused on the hotel (lodging) industry, while the restaurant sector has been analysed to a lesser extent (Kukanja & Planinc, 2018). This finding was also supported by Assaf and Josiassen (2016), who conducted a literature review on efficiency measurement in tourism. Their findings also revealed a lack of a standardised set of efficiency measurement variables within the tourism industry. Accordingly, studies on efficiency analysis provide a set of heterogeneous variables, making the comparability of research virtually impossible.

In terms of restaurant efficiency measurement, many researchers have tried to measure restaurant efficiency using many input and output variables (studies are presented in Table 1). Input variables mainly include the different internal (e.g. the number of employees, cost of salaries, cost of goods and materials) and external (e.g. size, location, competition) restaurant business characteristics. On the contrary, sales revenues were most often used as the output variable. Interestingly, few studies (e.g. Kukanja & Planinc, 2020, 2019, 2018; Planinc & Kukanja, 2020, 2019) implemented a generic approach to restaurant efficiency measurement. The authors mentioned above used the requisite assets (labour costs, cost of goods and materials sold, depreciation, and cost of services) as inputs into the business process and sales revenues as outputs (see Table 1). Namely, both dependant variables (requisite assets and sales revenues) present the base of any business process regardless of the business activity, enabling the comparison of research results and presenting a solid base for benchmarking and efficiency improvement. Interestingly, to the best of our knowledge, no efficiency studies using requisite assets and sales revenues as research variables were performed for other tourism sectors (e.g. hotels and tourist agencies). Consequently, the influence of the internal (entrepreneurial) and external (environmental) business characteristics on the management of the requisite assets (MRA), and consequently their (potential) influence on efficiency performance, remains unanswered.

However, previous research confirmed the importance of the different environmental characteristics such as location (Giménez-García et al., 2007) and competition (Reynolds, 2004) for restaurant efficiency performance. To the extent of our knowledge, there is no empirical evidence exploring the relationship between entrepreneurial characteristics and efficiency performance in restaurant SMEs so far. Nevertheless, very few studies from other (non-restaurant) service sectors confirmed the importance of the different entrepreneurial characteristics for SMEs' efficiency performance. For example, Tajeddini et al. (2013) proved the importance of entrepreneurial orientation (EO) for the efficient performance of small retailers and Tajeddini (2015) confirmed a positive correlation between EO and the efficiency of hotels in Switzerland. In this view, it is essential to highlight that these results have to be interpreted with caution, as the authors presented above used financial performance indicators (e.g. profitability achievement), which are considered measures of effectiveness (Turk, 2006), which further contribute to the inability of comparing research results. However, in terms of EO, Haber and Reichel (2007) reported the importance of education for small tourism ventures' business performance (profit growth) in Israel. Similarly, Bujan (2020) confirmed the importance of business-related education, risk preference, and proactivity for the financial and non-financial business performance of small family hotels in the nearby Republic

of Croatia. Although we can substantially learn about the importance of entrepreneurial characteristics from previous research outside the restaurant sector, it is impossible to compare research findings due to the differences in methodological approaches.

As a result, the authors wanted to overcome this shortcoming in the literature by developing a generic efficiency measurement model for the restaurant industry that puts the requisite assets at its centre (see Figure 1). We also wanted to examine the impact of the environmental (external) and entrepreneurial (internal) characteristics on MRA and, consequently, analyse their impact on restaurant SMEs' operational efficiency. The external environmental characteristics refer to the size and location of the facility and the number of competitors, while the internal entrepreneurial characteristics are represented by EO, entrepreneurial self-efficacy (ESE), and demographic characteristics of entrepreneurs (DC) (Mhlanga, 2018; Roh & Choi, 2010; Tajeddini, 2015).

Accordingly, the aim of this paper is to (1) analyse the impact of the external (environmental) and internal (entrepreneurial) characteristics on MRA, (2) investigate the impact of MRA on efficiency, with (3) the goal of designing and testing a generic measurement model that could apply to the rest of the tourism and service sectors since it is based on generic and comparable business characteristics (Figure 1).

This study employs a mixed methodological approach. After the literature review, primary data were collected from managers and secondary data were obtained from restaurant SMEs' official financial reports. For the empirical analysis, different statistical techniques were applied (see Section 3).

This paper is divided into several sections. First, a theoretical background of efficiency analysis, entrepreneurial, and demographic characteristics is provided. Next, the research methodology is presented, followed by a presentation and discussion of the results. In conclusion, suggestions for future research and valuable information for restaurant managers are provided.

2 Theoretical background

2.1 Efficiency Analysis in the Restaurant Industry

Efficiency refers to the relationship between the observed and optimal values of inputs and outputs (Fried et al., 2008). The most commonly used econometric method for restaurant efficiency measurement is the data envelopment analysis (DEA) (Kukanja & Planinc, 2020). DEA analyses the efficiency of firms (units) in a sample based on a linear programming method. The most efficient units in the sample represent the frontier, while the inefficient units are positioned below the frontier according to their efficiency score (Coelli et al., 2005). There are two DEA models for evaluating firms' efficiency: the constant returns to scale (CCR) model and the variable returns to scale (BCC) model. The CCR model assumes that all units in the sample perform optimally. In contrast, the BCC model assumes that the production possibilities frontier is convex and fits the most efficient units in the sample (Assaf & Josiassen, 2016).

DEA enables the simultaneous analysis of a larger number of variables. The selected variables can either be influenced by the management and are considered controllable (e.g., food costs) or outside managerial influence and are considered uncontrollable (e.g., number of competitors). Despite its flexibility, the main disadvantage of DEA is its sensitivity to measurement errors, meaning that any deviation from the frontier is treated as a consequence of a firm's inefficiency (Assaf & Josiassen, 2016).

The origins of efficiency analysis using DEA in the restaurant industry date back to the 1980s. In Table 1, DEA studies in the restaurant industry are presented in chronological order.

As shown in Table 1, in previous DEA studies, authors used different input and output variables to analyse restaurant efficiency with the different research goals, which hinders the comparison of research results. For example, Banker and Morey (1986) focused on the impact of fixed uncontrollable inputs. Taylor et al. (2009) employed efficiency analysis to develop a multidimensional methodology for menu analysis in the USA. Giokas et al. (2015) used panel data to determine the efficiency of Greece's pre-recession and recessionary periods. In their study, Mhlanga (2018) used panel data to identify factors impacting restaurant efficiency in South Africa.

The literature review also reveals that researchers are heterogeneous in selecting input variables. Input variables predominately include the following restaurant characteristics: number of employees, the cost of goods and materials sold, labour cost, rent, taxes and insurance, employee satisfaction, restaurant size, and the number of competitors. On the contrary, scholars are relatively homogeneous in selecting the output variables as sales revenue is the predominant output variable in most studies (twenty-one out of twenty-eight).

Analysis of previous studies has also revealed that some of the input variables, such as the number of employees (Assaf et al., 2011), labour costs (Fang & Hsu, 2014), operating expenses (Giokas et al., 2015), and the value of assets (Parte & Alberca, 2019) were considered as controllable. On the contrary, other input variables, such as size (Hadad et al., 2007), the number of competitors (Giménez-García et al., 2007), and location (Donthu & Yoo, 1998) were treated as uncontrollable.

To our best knowledge, the only studies that applied a systematic approach to efficiency measurement were those

Table 1: Efficiency analysis in the restaurant industry using DEA (1986-2020) – selection of variables

Authors	Inputs	Outputs
Hruschka (1986)	no. of seats, labour costs, cost of goods and materials sold, other operating expenses	sales revenue
Banker & Morey (1986)	cost of goods and materials sold, labour costs, age of the facility, advertising costs, location, presence of a drive-in counter	sales revenue
Andersson & Hartman (1995)	no. of seats, no. of employees, fixed costs, labour costs	no. of guests, contribution margin
Donthu & Yoo (1998)	size of the facility, years of experience as a manager, location, advertising costs	sales revenue, guest satisfaction
Reynolds (2003)	labour hours	sales revenue
Reynolds (2004)	labour hours, the average salary of employees, no. of seats, no. of competitors	sales revenue, tips
Lan et al. (2006)	salary of employees, cost of social insurance, cost of water, electricity and gas	income, no. of guests, cash flow
Reynolds & Thompson (2007)	salary of employees, no. of seats	sales revenue, tips
Reynolds & Biel (2007)	cost of goods and materials sold, labour costs, employee satisfaction, no. of seats, tax and insurance costs	income, retention equity
Hadad et al. (2007)	no. of seats, average no. of total employees, average no. of employees per shift, size of the facility	average no. of guests per day, average selling price
Giménez-García et al. (2007)	no. of employees, no. of seats and counters, location, no. of competitors, average consumption per guest	sales revenue, service quality
Taylor et al. (2009)	meal preparation method, no. of suppliers, number of kitchen stations	gross profit, meal popularity
Roh & Choi (2010)	size of the facility, size of the dining room, size of the kitchen, no. of seats and tables, no. of all employees, no. of kitchen and dining room staff, the salary of employees, rent, overheads	sales revenue, net income
Assaf et al. (2011)	no. of employees, food and beverage costs, no. of seats	sales revenue (separate for food and beverage)
Joo et al. (2012)	labour costs and hours	sales revenue, no. of guests, no. of receipts
Gharakhani et al. (2012)	labour hours, size of the facility, years of experience as a manager	no. of guests, sales revenue
Fang & Hsu (2014)	labour costs, cost of goods and materials sold, no. of suppliers	gross profit, meal popularity
Giokas et al. (2015)	operating expenses (excluding the cost of goods and materials sold), the value of assets	sales revenue
Mhlanga (2018)	no. of employees, no. of seats, labour costs, other operating expenses	sales revenue, total covers
Alberca & Parte (2018)	labour costs, other operating expenses, the value of assets	sales revenue
Kukanja & Planinc (2018)	requisite assets	sales revenue
Parte & Alberca (2019)	no. of employees, labour costs, other operating expenses, the value of assets	sales revenue

Table 1: Efficiency analysis in the restaurant industry using DEA (1986-2020) – selection of variables (continues)

Authors	Inputs	Outputs
Planinc & Kukanja (2019)	requisite assets	sales revenue
Kukanja & Planinc (2019)	requisite assets	sales revenue
Karakitsiou et al. (2020)	no. of local units, number of employees and investments	turnover
Kukanja & Planinc (2020)	requisite assets	sales revenue
Planinc & Kukanja (2020)	requisite assets	sales revenue
Hodžić et al., (2020)	no. of entrepreneurs in the restaurant sector, average no. of employees, expenses for employee wages and contributions	total revenues, net profits, tourist overnights

performed by Kukanja and Planinc (2020, 2019, 2018) and Planinc and Kukanja (2020, 2019). The authors stressed the necessity of a standardised approach to efficiency measurement and proposed a standardised set of inputs (the requisite assets) and output (sales revenue). Moreover, we found no previous studies investigating the importance of entrepreneurial characteristics (as indicators of the internal environment) for restaurant efficiency performance (see Table 1).

Another critical finding is that in previous DEA studies, all input variables (despite controllable or uncontrollable) were equally treated as direct inputs into the DEA. Specifically, the prerequisite assets should be considered as a dependent variable since their management is influenced by the different factors arising from the internal and external business environment. Accordingly, we intend to close the gap in the literature by systematically analysing the impact of entrepreneurial (internal) and environmental (external) characteristics on MRA and restaurant efficiency. For this study, variables were selected based on the literature review (Table 1). The identified environmental characteristics are size, location of the facility, and the number of competitors, while the identified entrepreneurial characteristics are EO, ESE, and DC (see also Section 3.1 – Instrument design).

2.2 Entrepreneurial Characteristics

2.2.1 Entrepreneurial Orientation (EO)

EO is often referred to as a precursor of competitive advantage, growth and business performance and refers to the policies and practices that form the basis for entrepreneurial decision-making and action. Three main dimensions (constructs) best explain EO: innovativeness, proactiveness, and risk-taking (Kraus et al., 2012).

Innovativeness refers to creativity and is most evident in developing and implementing new business ideas. The risk-taking dimension refers to how entrepreneurs are willing to take risky and bold decisions, while proactiveness refers to taking business initiatives or exploiting market opportunities (Rauch et al., 2009).

In terms of analysing the influence of EO on efficiency, the review of the literature (Kallmuenzer et al., 2019; Tajeddini, 2015; Tajeddini et al., 2013) has confirmed the correlation between the two concepts. In this view, we have to point out that the authors mentioned above have equated efficiency with effectiveness (financial performance), which further contributes to the inability to carry out comparative analyses.

2.2.2 Entrepreneurial Self-efficacy (ESE)

The ESE dimension encompasses an individual's belief that he or she can successfully perform a variety of entrepreneurial tasks. ESE mainly refers to developing new products or services and market opportunities, creating an innovative environment, finding potential investors, developing a clear business concept, coping with unexpected challenges and developing human resources (Hallak et al., 2018). In reviewing the literature, we found that researchers have studied ESE relating to financial performance (Bratkovič Kregar et al., 2019; Hallak et al., 2014; Lee & Hallak, 2018). Previous research mostly confirms a positive correlation between ESE and financial performance. Moreover, the authors mentioned above highlighted the

importance of training and education, which significantly contribute to higher levels of ESE. Interestingly, no studies were found on efficiency. Interestingly, no studies were found on efficiency.

2.2.3 Demographic Characteristics of Entrepreneurs (DC)

In the efficiency analysis of restaurant SMEs, it is also essential to underscore the importance of entrepreneurs' DC. Previous studies mainly analysed the importance of DC for business decision-making (Goll & Rasheed, 2005; Tavitiyaman et al., 2014). However, research findings do not provide a clear-cut answer on the importance of DC for SMEs' financial performance. For example, Mazzarol et al. (1999) found that women are less likely to enter the world of business, Kristiansen et al. (2003) found that DCs were only marginally related to financial performance, and Bujan (2020) reported a positive relationship between business-related education and business performance. Again, no studies were found on efficiency.

In previous research (Kallmuenzer et al., 2019; Lee & Hallak, 2018; Tajeddini, 2015), entrepreneurial characteristics significantly influenced business performance. According to the characteristics of the restaurant industry presented in Section 1, the manager is actively involved in the operational process. Therefore, we can assume that his EO, ESE, and DC can (hypothetically) directly influence MRA and, consequently, restaurant efficiency performance.

2.3 Environmental Characteristics

Entrepreneurs mostly have no (direct) influence on environmental factors. Authors who studied the impact of the external environment on restaurant efficiency have come to different conclusions. For example, Gharakhani et al. (2012) found that larger restaurants are more efficient, while Gimenez (2004) reported higher efficiency in smaller restaurants. Sanjeev (2007) also confirmed a weak, positive correlation between size and efficiency.

In contrast, research examining the correlation between location and efficiency is relatively scarce. Reynolds (2000) and Sanjeev (2007) found that restaurants located in/or near cities achieve higher efficiency. Regarding the number of competitors, Giménez-García et al. (2007) confirmed a positive relationship between market competition and efficiency.

Based on the theoretical findings presented above, we can conclude that entrepreneurial and environmental characteristics are important determinants of restaurant performance. Nevertheless, the two characteristics do not present direct inputs into an operational process. However, they should be considered as internal and external factors that (hypothetically) influence restaurant MRA and, consequently, restaurant efficiency performance.

Accordingly, we propose a research model (Figure 1) in which we investigate the influence of environmental and entrepreneurial characteristics (independent variables) on MRA (dependent variable), which are considered as an input into the efficiency analysis model. Since we are interested in operational efficiency, operational sales are a dependent output variable.

Accordingly, we propose two main hypotheses:

RH1: Environmental characteristics (size, location, and the number of competitors) impact MRA and, consequently, efficiency.

RH2: Entrepreneurial characteristics (ESE, DC (gender, age, education, work experience, ownership, and EO) impact MRA and, consequently, efficiency.

3 Methods

3.1 Research process, instrument design, and data analyses

Environmental and entrepreneurial characteristics were analysed based on instruments collected from previous research. For measuring EO, we adopted a 12-item scale from a study by Kostanjevec and Gomezelj Omerzel (2013), while for measuring ESE, we applied a 23-item scale developed by De Noble et al. (1999). The importance of entrepreneur DC was measured based on the following variables: age, formal education, years of experience, ownership, and work experience (Goll & Rasheed, 2005; Reynolds, 2000; Tavitiyaman et al., 2014). Since the theory does not provide a clear answer about the importance of DC, each DC variable was measured only at the individual level (see Figure 1). Environmental characteristics were assessed based on the following variables: restaurant size (Gharakhani et al., 2012), location (Reynolds, 2000; Sanjeev, 2007), and the number of competitors (Giménez-García et al., 2007). Additionally, we collected some basic physical information about the restaurant facilities, such as the number of employees and years of business activity. Financial (secondary) data for the efficiency analysis were obtained from the Agency of the Republic of Slovenia for Public Legal Records and Related Services (Ajpes, 2021).

For this study, various statistical approaches were applied. Efficiency was analysed using DEA; factor structure was investigated with exploratory factor analysis (EFA), and the measurement model was validated using confirmatory factor analysis (CFA). Finally, the relationships between the observed variables were tested using structural equation modelling (SEM).

3.2 Sample description and data collection

The sample consists of restaurant SMEs in the Republic of Slovenia classified according to the EU standard classification of activities (NACE) as I56.101 (Restaurants and inns) and I56.102 (Snack bars and similar). In 2019, there were 3,226 business entities in both classifications (Ajpes, 2021), representing almost 50% of the Food and Beverage (F&B) sector (6,496 business entities) in Slovenia. The unavailability of information regarding the characteristics of restaurant SMEs included in our model led us to use a convenience sampling method.

The survey took place between October and the end of December 2019 and was conducted by ten interviewers. Only those SMEs generating operating revenue from restaurant sales were included in the survey. Accordingly, to verify that SMEs are appropriate for inclusion in the analysis, respondents were asked to confirm that they have no other sources of revenue. At the end of the data collection, the sample consisted of 266 restaurant SMEs, representing slightly over 8% of the I56.102 and I56.101 populations.

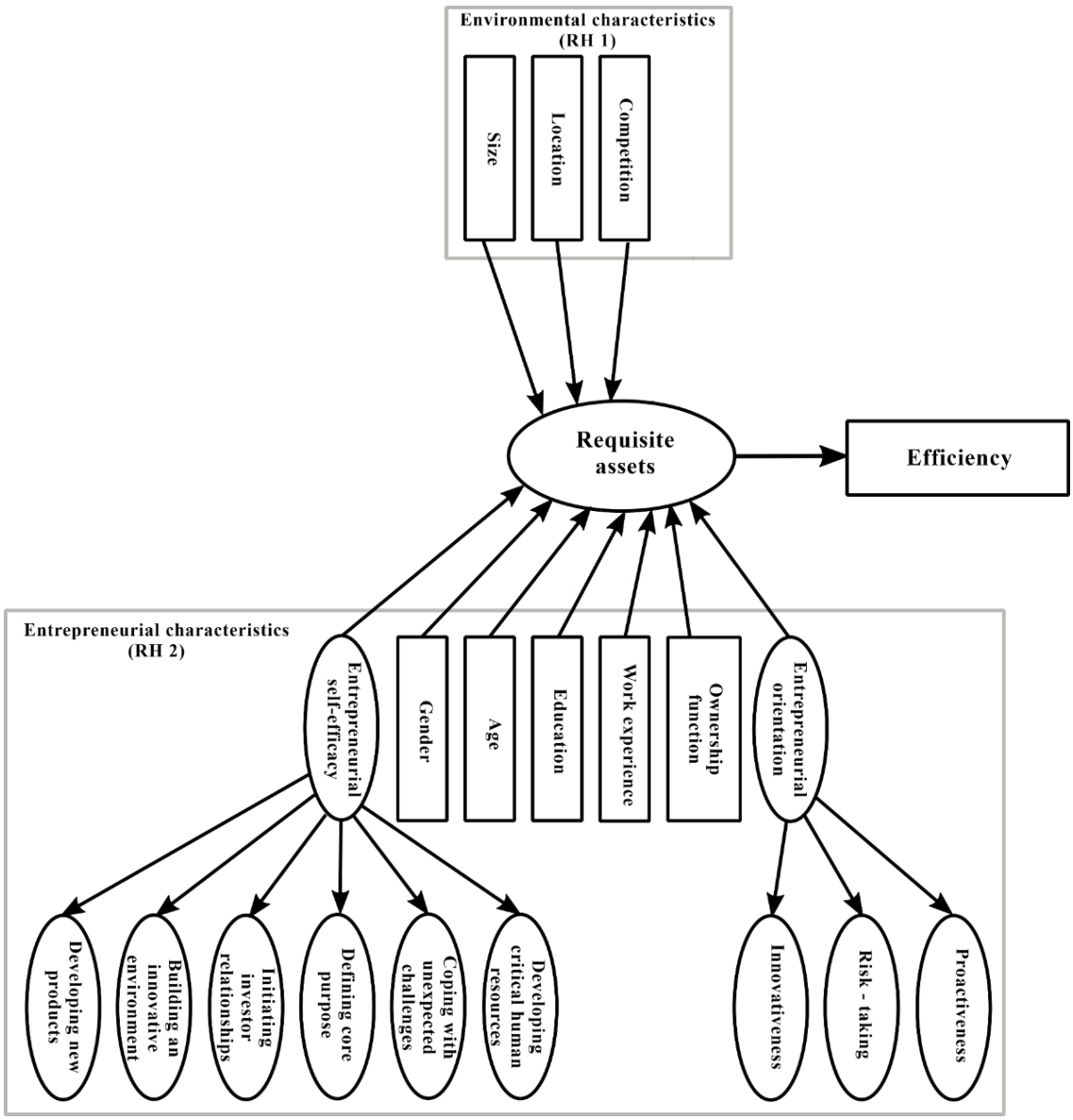


Figure 1: Theoretical Model

4 Results

4.1 Sample Characteristics

Characteristics of restaurants included in the research are presented in Table 2.

The physical and environmental characteristics presented in Table 2 indicate that slightly over half of restaurants (50,8%) are located in cities. Their average size is just over 270 square metres. On average, they have 119 seats. The largest proportion of restaurants employs up to ten employees (80.5%). On average, restaurants have 22.7 years of business activity, and respondents reported approximately four competing restaurants in their vicinity. The sample was mainly composed of male respondents (59.4%), whose average age was 43. The majority of respondents (67.3%) had completed vocational or secondary

Table 2: Restaurants' and respondents' characteristics

Variables		**Frequency**
Restaurants' physical and environmental characteristics		
Location	city	135
	suburban areas	99
	rural areas	32
Restaurant size (number of seats)	up to 50	25
	over 50 up to 100	90
	more than 100	151
Number of employees	up to 10	214
	over 10 up to 20	41
	more than 20	11
Years of business activity	up to 10	96
	over 10 up to 20	67
	more than 20	103
Number of competitors (within a 1 km radius)	up to 5	202
	over 5 up to 10	46
	more than 10	18
Respondents' demographic characteristics (DCs)		
Gender	male	158
	female	108
Age	up to 35	63
	over 35 up to 45	87
	over 45 up to 55	95
	more than 55	21
Level of education	primary school	3
	vocational or secondary school	179
	higher education	84
Years of experience	up to 10	59
	over 10 up to 20	87
	over 20 up to 30	82
	more than 30	38
Ownership structure	owner and manager	205
	manager	61

Table 3: Entrepreneurial Self-Efficacy (ESE)

ESE	Variables	M	SD
Developing new product and market opportunities			
1	I can see new market opportunities for new products and services.	4.02	0.789
2	I can discover new ways to improve existing products.	4.09	0.779
3	I can identify new areas for potential growth.	4.11	0.810
4	I can design products that solve current problems.	4.06	0.919
5	I can create products that fulfil customers' unmet needs.	3.97	0.931
6	I can bring product concepts to market in a timely manner.	3.95	0.886
7	I can determine what the business will look like.	3.66	0.886
Building an innovative environment			
8	I can create a working environment that lets people be their own boss more.	3.79	0.951
9	I can develop a working environment that encourages people to try out something new.	4.05	0.876
10	I can encourage people to take initiative and responsibility for their ideas and decisions, regardless of outcome.	3.92	0.970
11	I can form partner or alliance relationships with others.	3.92	0.991
Initiating investor relationships			
12	I can develop and maintain favourable relationships with potential investors.	3.70	1.197
13	I can develop relationships with key people who are connected to capital sources.	3.67	1.173
14	I can identify potential sources of funding for investment.	3.65	1.036
Defining core purpose			
15	I can articulate vision and values of the organisation.	4.25	0.771
16	I can inspire others to embrace the vision and values of the firm.	3.98	0.864
17	I can formulate a set of actions in pursuit of opportunities.	3.94	0.894
Coping with unexpected challenges			
18	I can work productively under continuous stress, pressure, and conflict.	4.05	0.956
19	I can tolerate unexpected changes in business conditions.	4.02	0.829
20	I can persist in the face of adversity.	4.30	0.727
Developing critical human resources			
21	I can recruit and train key employees.	4.12	0.885
22	I can develop contingency plans to backfill key technical staff.	3.81	0.987
23	I can identify and build management teams.	4.12	0.930

education. In terms of their work experience, respondents have, on average, 20 years of experience in the restaurant sector, and the majority of them (77.1%) reported owning their restaurants.

Results of secondary data reveal that the average value of labour cost is €116,986.74, depreciation is €11,738.61, the cost of goods and materials sold is €175,131.54, the cost of services is €73,571.34, and sales revenue is €401,896.76.

Next, ESE was analysed. In Table 3, results indicating ESE using mean values (M) and standard deviations (SD) are presented.

Table 4: Entrepreneurial Orientation (EO)

EO	Variables	M	SD
Innovation			
1	Since the firm was founded, we have not introduced many new products and services to the market.	2.76	1.327
2	Changes in our products and services are usually minor.	3.10	1.203
3	There is not a strong focus on the development of new products and services.	2.73	1.221
4	The firm does not have a strong focus on introducing new technologies that emerge on the market.	2.83	1.222
5	From the time the firm was founded until today, there have not been many improvements in products and services.	2.41	1.254
6	There is no emphasis on developing in-house solutions, both technological and administrative.	2.47	1.188
Risk Orientation			
7	Preference is given to products and services that are risk-neutral and have an average return.	3.03	1.210
8	In our competitive environment, it is wiser to make conservative and incremental decisions.	3.06	1.156
9	We prefer to thoroughly investigate the opportunity first and then make a decision.	3.70	1.009
Proactivity			
10	Our firm usually only reacts to actions triggered by other competitors in the market.	2.43	1.171
11	Compared to competitors, we are very rarely the first to introduce new products and services, process technologies and other business practices.	2.57	1.212
12	We usually wait for the leading competitor to enter the market first with new products and services before we follow.	2.15	1.175

As shown in Table 3, the highest-rated indicator was ESE-20, indicating their ability to cope with difficult situations (M=4.30). The lowest-rated indicator was ESE-14, indicating entrepreneurs' ability to find financial sources (M=3.65).

Next, EFA (principal axis factoring method was used) was employed to examine the factor structure of ESE (oblimin rotation was used). Based on the correlation coefficient values (showing no multicollinearity issues), all 23 indicators were included in the analysis. Results of the KMO test value (0.878) as well as the value of the Bartlett's test ($p = 0.000 < 0.05$; approximate $\chi2 = 2970.126$; $df = 253$) indicate the suitability of the data for performing EFA. We followed Kaiser's rule when determining the number of factors, suggesting that eigenvalues should be above one and at least 50% of variance should be explained with the obtained factors. Based on the results of EFA, six factors (ESE dimensions) were obtained. The final model explains 56.67% of the total variance.

In the next step, respondents' opinion on EO was investigated.

The results in Table 4 show that the highest-rated indicator was EO-9, indicating that managers generally prefer to explore business opportunities and then decide (M=3.70). The lowest scores relate to EO-12 (M=2.15), meaning that they usually do not wait for the leading competitors to enter the market first and then follow.

Next, EFA (principal axis factoring method was used) with oblimin rotation was used to examine the factor structure of EO. All 12 indicators were included in the analysis based on the correlation coefficient values. Results of the KMO test value (0.886) as well as the value of the Bartlett's test ($p = 0.000 < 0.05$; approximate $\chi2 = 1564.739$; $df = 66$) indicate the suitability of the data for performing EFA. Results show that three dimensions of EO explain 57.83% of the total variance.

4.2 Efficiency Analysis

Next, we proceeded with DEA. Before performing DEA (the CCR model was used), we first checked whether

there is a correlation between inputs and outputs, which was established using the Pearson correlation coefficient. Results show that the average efficiency for all restaurants is 65.8%, 19 restaurants achieve 100% efficiency, 122 restaurants achieve efficiency scores above the average, and 144 restaurants perform below the average. The results also suggest that restaurants that performed below the average could reduce their inputs by 34% and still achieve the same level of sales revenue. The analysis of the requisite assets shows that restaurants have the most place for efficiency improvement in terms of optimising their depreciation costs, which could be, on average, reduced by 37%. Restaurants performing below the average could therefore reduce their depreciation costs, on average, by 46%.

4.3 Validation of the model (CFA)

After EFA, we conducted CFA on both constructs (ESE and EO) to justify the appropriateness of the obtained dimensions or latent variables for inclusion in the measurement model. We excluded three indicators based on the low values of their standardised factor loadings (below 0.5). These indicators are ESE-7 (I can determine what the business will look like), ESE-11 (I can form partner or alliance relationships with others), and EO-9 (We prefer to thoroughly investigate the opportunity first and then make a decision). We could not confirm discriminant validity in both cases, so we decided to introduce a second-order latent variable. ESE is measured with six latent variables referring to its six dimensions, while EO is measured by the three latent variables (Tables 3 and 4). The latent variables (obtained in EFA) can be defined as first-order latent variables. Consequently, both ESE and EO can be defined as second-order latent variables. In the case of the second-order latent variable, the first-order latent variables act as independent variables. Therefore, they are expected to be more strongly correlated, and consequently, discriminant validity has no significant meaning in determining the model (Koufteros et al., 2009).

In the case of ESE, the proposed measurement model shows a good model fit. The $\chi 2$ ratio with respect to degrees of freedom is appropriate ($\chi 2/df = 1.90 < 3$) and goodness-of-fit indices (CFI = 0.91 > 0.9; SRMR = 0.059 < 0.08) show appropriate fit. The value of RMSEA is also satisfactory (0.068). Only the value of TLI (0.898) is slightly below 0.90. Nevertheless, the indicators point to a good fit of the model. The standardised factor loadings related to the second-order latent variables have values between 0.528 and 0.884, all statistically significant. This indicates a strong correlation between the second-order latent variable and the first-order latent variables. Consequently, the convergent validity of the second-order latent variable ESE is confirmed.

In the case of EO, the fit indices also show a good model fit. The $\chi 2$ ratio with respect to degrees of freedom is appropriate ($\chi 2/df = 2.65 < 3$), while fit indices are above the recommended threshold (CFI = 0.937 > 0.9; SRMR = 0.047 < 0.08). RMSEA (0.092) and TLI (0.916) also have satisfactory values. The standardised factor loadings relating to the second-order latent variable have values between 0.725 and 0.904 and are all statistically significant. This indicates a strong association between the second-order latent variable EO and the six first-order latent variables. Consequently, the convergent validity of the second-order latent variable EO is confirmed.

Next, we checked fit indices for the overall measurement model (ESE and EO). All standardised factor weights are above 0.5, all AVE values are above 0.5, and all CR values are above 0.7. Consequently, we can confirm the construct validity of the measurement model.

In the analysis of the initial SEM, we were unable to confirm some hypotheses. In order to find the most parsimonious model, the nested model approach was applied. By comparing the so-called nested models, we simplified the model to a form in which only variables connected with statistically significant paths were retained. The path with the weakest influence was removed in each step, and the resulting model was compared with the previous one (Kline, 2011). In subsequent steps, five paths were removed. The final model has satisfactory goodness-of-fit indicators ($\chi 2/df = 1.59 < 3$; SRMR = 0.061; RMSEA = 0.049). The CFI (0.880) and TLI (0.873) are slightly below the 0.9 thresholds; however, when all indicators are considered together, the final model fits the data reasonably well.

The location variable was measured as a nominal variable with three categories: rural area, suburban area, and urban (city) area. To include this variable in the research model, we formed two dichotomous variables (Location-suburban area and Location-rural area). The urban area was selected as the reference category. A summary of the final model results is presented in Table 5.

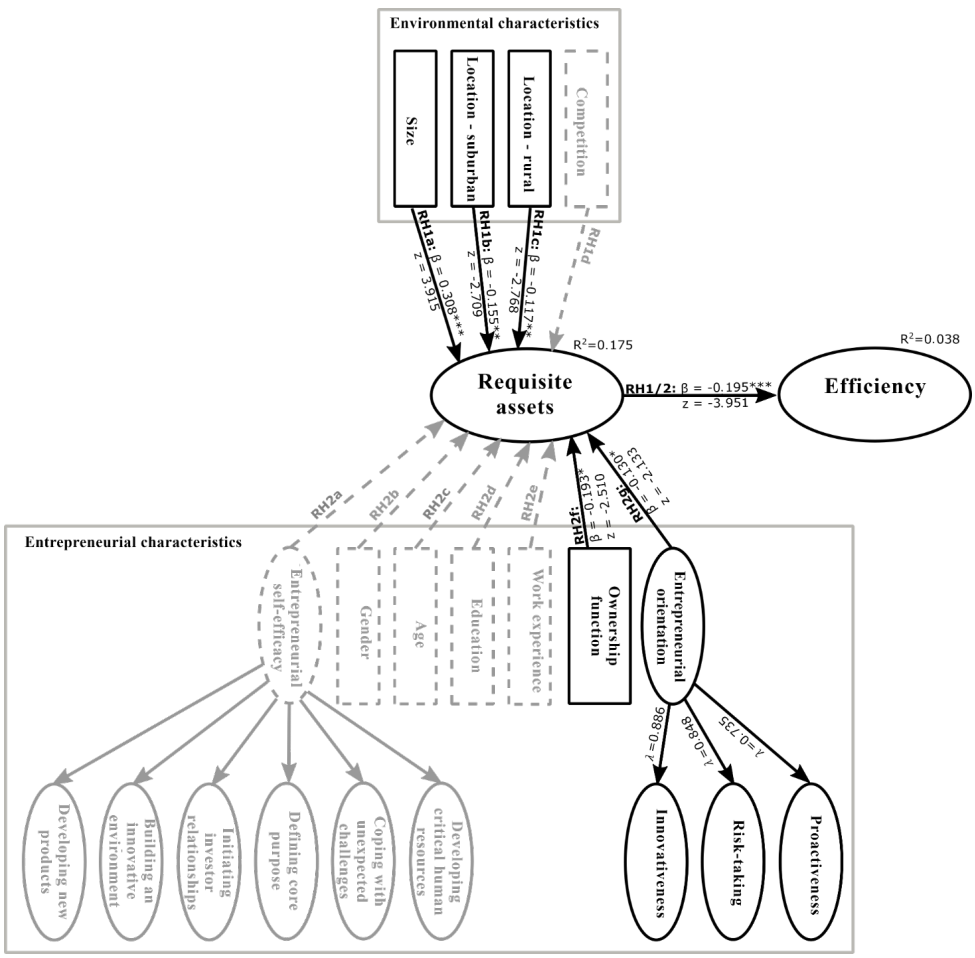
Based on the results of SEM, we cannot confirm the influence of all environmental variables. Specifically, competition (RH1d) proved not to be significant for MRA. Since we employed the nested model procedure, only significant impacts will be discussed in detail. Size (RH1a; $\beta = 0.3108$) and location – suburban (RH1b; $\beta = -0.155$), and rural (RH1c; $\beta = -0.117$) have a significant impact on MRA. As emphasised before, the location was a nominal variable with three categories, and two dichotomous variables were composed, selecting urban as a reference category. Negative coefficients for both dichotomous variables indicate that values of MRA are lower in suburban and rural areas than the urban ones.

In terms of entrepreneurial characteristics, we cannot confirm the correlations in the cases of the entire ESE dimension (RH2a) and for most DCs (RH2b, RH2c, RH2d, and RH2e.) A statistically significant correlation was confirmed only for ownership function (RH2f; $\beta = -0.193$). In contrast and interestingly, the entire EO dimension (RH2g)

Table 5: Summary of hypothesis testing for SEM

Hypothesis	Path	Standardised Path Coefficient	z-Value	Hypothesis Supported?
RH1a	Size → RA	0.308	3.915***	Yes
RH1b	Location – suburban area → RA	- 0.155	- 2.709**	Yes
RH1c	Location – rural → RA	- 0.117	- 2.768**	Yes
RH1d	Competition → RA			No
RH2a	ESE→ RA			No
RH2b	Gender → RA			No
RH2c	Age → RA			No
RH2d	Education → RA			No
RH2e	Work experience → RA			No
RH2f	Managerial-ownership function → RA	-0.193	-2.510*	Yes
RH2g	OE → RA	-0.130	-2.133*	Yes
RH1/2	RA → Efficiency	-0.195	3.951***	Yes

Note: *** p < 0,001; ** p < 0,01; * p < 0,05; RA = requisite assets



Note: Non-significant paths between variables are indicated with a grey dashed line

Figure 2: SEM

has a statistically negative impact on the values of the requisite assets (β = -0.130).

The identified five characteristics explain 17.5% of the variability for the requisite assets' variable (R2 = 0.175). As hypothesised in RH1/2, the requisite assets have a statistically negative impact on efficiency (β = -0.195). Accordingly, we can confirm RH1/2. The predictor variables explain 3.8% of variability for the efficiency variable (R2 = 0.038).

5 Discussion

Our analysis has led us to some interesting conclusions. The analysis of the hypotheses revealed that RH1 (environmental characteristics) could be mostly confirmed, while RH2 (entrepreneurial characteristics) can only be partially confirmed. In terms of size, larger restaurants consume more assets in their business processes and, as expected, have higher values of requisite assets compared to smaller restaurants. In contrast, results show that restaurants located in rural areas have lower requisite assets values than restaurants located in cities. A possible explanation for this might be that restaurants in rural areas may have more possibilities to produce their ingredients or buy them directly from producers at lower prices. Additionally, in urban areas, restaurants are more likely to offer high-end interiors (as an element of competitiveness), requiring higher values of requisite assets.

Interestingly, in our case, the number of competitors has no impact on MRA and consequently on efficiency. This finding is not in line with the literature (Giménez-García et al., 2007; Reynolds, 2004), which reported a correlation between the number of competitors and efficiency. Nevertheless, in comparing the results of our study with previous research, we have to be cautious. For example, the study by Giménez-García et al. (2007) was performed in a specific environment (on restaurants operating in shopping malls), while Reynolds (2004) did not report on testing the correlation between variables before performing DEA.

Next, the importance of entrepreneurial characteristics for assuring restaurant efficiency was analysed. Research results confirmed only the importance of EO in managing SMEs' requisite assets and efficiency. Previous studies (e. g. Bujan, 2020; Haber & Reichel, 2007; Hallak et al., 2014; Lee & Hallak, 2018) confirmed the importance of EO for SMEs' effectiveness. However, due to the differences in methodological approaches (efficiency ≠ effectiveness), the results of our study cannot be compared to previous research.

Our study found that those SMEs whose managers have a more pronounced EO have lower values of requisite assets. Specifically, innovativeness, proactivity and risk-taking proved to be important determinants of efficiency performance. Another interesting finding relates to the highest and the lowest rated EO indicators (see Table 4). In terms of entrepreneurs' risk orientation (EO-9), managers prefer to thoroughly investigate the opportunity first and then make a decision (M=3.70). On the contrary, in terms of proactivity (EO-12), they are less likely to wait for the leading competitor to enter the market first before they follow (M=2.15). Research results indicate that managers are relatively cautious when making decisions, although they do not like to follow the competition before launching new products and services. This result might be somehow related to the monopolistic characteristics of the restaurant industry (e.g. excess supply, many competitors offering slightly differentiated products and services, the decision regarding price or product of any firm does not significantly affect the competitive behaviour of other firms, low entry conditions to enter the market) (Hallak, 2018). Nevertheless, it is relatively difficult to explain these results due to the lack of comparative research. We might only assume that, based on their EO, managers have developed some entrepreneurial abilities that enable them to manage their business more efficiently.

Interestingly, the analysis did not confirm the impact of ESE on MRA and efficiency. Again, it is relatively difficult to explain these results since the literature (Lee et al., 2016; Lee & Hallak, 2018) only provides evidence related to the influence of ESE on effectiveness.

The results also reveal that DCs (except for the ownership function) do not influence MRA. In cases in which the manager is also the restaurant owner, the values of the requisite assets are lower. This finding implies that the owner-manager is more careful (and efficient) in managing the SME's requisite assets than the manager.

However, DC and ESE might be somehow intercorrelated since ESE could also be gained through education, mentorship, and work experience (Lee et al., 2016). In our study, the average age of managers was 43 years, and most of them (67.3%) reported having vocational or secondary education. Accordingly, we might assume that they did not gain any (formal) entrepreneurial education since, more than twenty years ago, entrepreneurship was not taught in schools in Slovenia. Interestingly, concerning the importance of education for business performance, Bujan (2020) reported that entrepreneurs of small family hotels in Croatia who had participated in business-related education performed better.

An absence of correlation was also evident in work experience. The result is surprising, but possible reasons may stem from the fact that there is no intergenerational transfer of mentoring skills (especially tacit knowledge) due to the deregulation of catering professions. Consequently, we might assume that managers are mostly self (incorrectly) taught. At the same time, respondents may have gained previous work experience at not necessarily managerial positions. Another possibility for these results could also be the relatively late start of strategic development of en-

trepreneurship in Slovenia, which only started in the late 1990s due to the transition process.

Based on research results, we can conclude that environmental characteristics significantly impact MRA and restaurant efficiency compared to entrepreneurial characteristics. In this respect, the analysis also confirmed a weak negative impact of MRA on efficiency. This result was expected, as we had already reported that managers could have achieved the same level of efficiency with lower values of requisite assets (on average: 34%).

6 Conclusion

In this paper, we aimed to (1) analyse the impact of the environmental and entrepreneurial characteristics on MRA, (2) investigate the impact of MRA on efficiency, with (3) the goal of designing and testing a measurement model for efficiency analysis, which is based on generic SMEs and entrepreneurial variables. The present study is thus the first to comprehensively address and examine the relationship among environmental and entrepreneurial characteristics, MRA, and restaurant efficiency. The selection of generic variables significantly contributes to our research and efficiency literature since it enables comparative analyses of efficiency measurement.

Based on the literature review, we formulated two main research hypotheses. The results indicate that environmental (RH1) and entrepreneurial (RH2) characteristics influence MRA and restaurant efficiency. Specifically, the following characteristics influence MRA and efficiency: size and location (environmental characteristics), and ownership and EO (entrepreneurial characteristics).

Based on the analysis, we conclude that SMEs' external environment on MRA and efficiency is much stronger than the influence of the internal environment. The external environment is generally not directly influenced by managerial decisions. This fact leads to the practical conclusion that it makes sense to strengthen the influence of the internal environment through the active development of entrepreneurial characteristics, which could consequently result in a more effective MRA and higher efficiency.

In terms of managerial application, managers could improve the potential of ESE and EO through active lifelong learning. Another recommendation refers to the improvement of restaurant efficiency. Results of DEA show that there is most potential for efficiency improvement in terms of depreciation costs. Nevertheless, according to Kukanja and Planinc (2018), this practice must be interpreted with caution. Namely, managers could use restaurants' physical (tangible) elements (e.g. interior design, layout, restaurant equipment) as critical elements of differentiation strategy. As a result, this practice might lead to higher depreciation costs since the use of the physical elements may not (yet) be reflected in higher sales revenues. Additionally, managers have also several (other) opportunities for improving SMEs' efficiency by networking and collaborating with other restaurant providers, which can also lead to economies of scale and cost optimisation (e.g. joint procurement).

Regarding other recommendations for policymakers, we also suggest the introduction of entrepreneurial skills in curricula at all education levels. Organising educational events might also present a challenge for restaurant associations. Moreover, academia should be more actively included in disseminating research results among restaurant managers.

Finally, we faced some limitations in conducting our research. The main limitations were the unwillingness of restaurant managers to participate in the study and the unavailability of industry-specific information related to the characteristics of restaurant SMEs. Specifically, restaurants are classified following their primary business activity, which means that they might also generate revenue from other businesses and report their financial data at an aggregated level. Accordingly, based on official reports, it is impossible to identify the entire population of restaurant SMEs that generate revenue solely from restaurant sales. Consequently, the sample design of our study was based on a convenience sampling method, the main limitation of which is the inability to draw statistical inferences from a sample to the population. A potential limitation could also present the research location, as Slovenia is one of the smallest economies within the EU. Therefore, it remains unclear whether research findings could be similar for other service industries and cultures. Another limitation refers to the time frame of the survey since it was carried out just before the outbreak of the Covid-19 pandemic. Finally, the lack of research on restaurant efficiency can also be considered a limitation.

We have also identified several opportunities for future research. The present study may represent an initial step in a longitudinal and cross-national (EU) comparative analysis of restaurant efficiency, providing valuable insights into the dynamics of assuring restaurant efficiency.

Another possible aspect for future research is the efficiency analysis related to the business life cycle. In the initial stages of the life cycle, the owner is also the restaurant manager; however, over time, there is often a need to reorganise or separate the managerial function by employing a manager (Lester et al., 2003). Further studies could also analyse the importance of managers' overconfidence and emotional unfitness for restaurant efficiency performance, as their significance for restaurant business failure was already reported by Camillo et al. (2008). Additional (state-of-the-art) variables such as green EO (Habib et al., 2020), characteristics of migrant restaurant entrepreneurs (Farrer, 2021), restaurant crowdfunding (Yang & Koh, 2022), or introduction of service robots (Seo & Lee, 2021) could also be introduced into the analysis. Finally, interviews with entrepreneurs could lead to valuable information in understanding restaurant efficiency management.

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Vpliv podjetniških in okoljskih značilnosti na upravljanje s prvinami poslovnega procesa ter učinkovitost v prehrambnem gostinstvu

Ozadje/namen: Mikro, mala in srednje velika podjetja so v poslovnem okolju podvržena različnim dejavnikom, ki vplivajo na njihovo poslovno uspešnost. V slovenskem prehrambnem gostinstvu je manager pogosto tudi lastnik obrata in posledično lahko s svojimi podjetniškimi lastnostmi neposredno vpliva na upravljanje s prvinami poslovnega procesa. V prispevku tako preučujemo vpliv podjetniških (samoučinkovitost in orientiranost) in demografskih lastnosti ter vpliv okoljskih oz. zunanjih (kraj in lokacija obrata in število konkurentov) značilnosti na upravljanje s prvinami poslovnega procesa in posledično na učinkovitost poslovanja.
Metodologija: Primarni podatki, ki se nanašajo na podjetniške, demografske lastnosti ter zunanje okolje, so bili pridobljeni z uporabo anketnega vprašalnika. Sekundarni podatki, ki zajemajo finančne podatke, so bili pridobljeni iz uradnih računovodskih izkazov. V analizo je vključenih 266 prehrambno gostinskih obratov, ki poslujejo na območju Republike Slovenije. Učinkovitost je bila analizirana z analizo ovojnice podatkov (DEA), za preverjanje raziskovalnega modela pa je bilo uporabljeno modeliranje strukturnih enačb (SEM).
Rezultati: Rezultati kažejo, da ima zunanje okolje večji vpliv na upravljanje s prvinami poslovnega procesa v primerjavi s podjetniškimi in demografskimi lastnostmi. Izkazalo se je namreč, da podjetniška samoučinkovitost in večina demografskih lastnosti (starost, spol, izobrazba in delovne izkušnje) ne vplivajo na upravljanje s prvinami poslovnega procesa in posledično na učinkovitost poslovanja.
Zaključek: Na zunanje okolje manager praviloma nima vpliva, zato je ključnega pomena, da se z aktivnim razvojem podjetniških lastnosti okrepi vpliv notranjega okolja, kar bi lahko privedlo do učinkovitejšega upravljanja s prvinami poslovnega procesa in posledično do višje učinkovitosti. V prispevku so podani predlogi za učinkovitejši izkoristek potenciala vpliva notranjega okolja, izboljšanje učinkovitosti ter smernice za nadaljnje raziskovanje.

Ključne besede: *Mikro, Mala in srednje velika podjetja, Prehrambno gostinstvo, Slovenija, Učinkovitost, Okoljske in podjetniške značilnosti, Prvine poslovnega procesa*

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